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PUBLISHED MONTHLY  
EDITED BY F. M. ROBINSON



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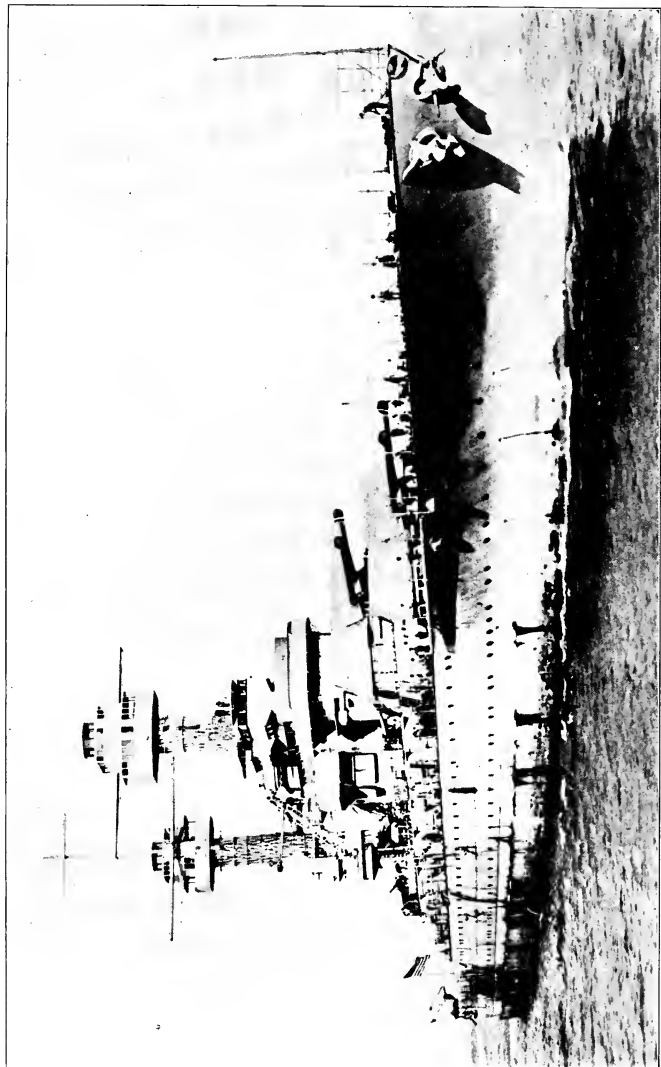
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## NAVAL TRAINING

By COMMANDER JOHN E. POND, U. S. Navy

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### FOREWORD

Having read in one of the service papers that the Secretary of the Navy has sent out a special invitation for suggestions from the naval personnel as to the adoption of economical methods, I feel safe in assuming that since the desire for economy is manifestly sincere these somewhat radical views on the subject of naval training will be well received by the Department and by the service in general. Their adoption would surely result in economy.

The Department's order as published reads:

For the purpose of co-operating to the fullest extent with the administration in its expressed policy of reducing expenditures of the government to the lowest basis consistent with efficiency, the department desires that suggestions and constructive criticism be submitted by anyone connected with the naval establishment, which tend to point out more economical methods of administration than those now in force in the Navy Department and in connection with the operations of the U. S. naval vessels and stations.

The criticism and suggestions herein referred to need not be confined to matters within the scope of the particular duty of the person making them, but it is directed they be addressed to "The Secretary of the Navy (Budget Officer)," submitted via the usual channels to insure the department having the benefit of the endorsement and comment of the senior officials.

Before proceeding with my suggestions I must refer the reader to an article written by me and published in the U. S. NAVAL

INSTITUTE PROCEEDINGS, Vol. 47, No. 7, Whole No. 221, July, 1921, and particularly to page 1004 wherein I proposed defining the status of "ships in active reserve" as follows:

Vessels in this condition are fully officered, but with reduced crew sufficient only to maintain the vessel in material readiness for service and to perform such operations as may be necessary to insure efficient performance of the material. Such vessels are attached to the active fleets and are available to replace vessels of the active fleets on short notice. They are also available as practise ships for the Naval Reserve Force, the Naval Academy, and other training purposes.

Also to page 1010:

Ships in active reserve should be detailed for training the first reserve.

At least two such ships should be detailed to this duty at each reserve base. If the number of first reserves applying for training require it, two groups of such ships should be detailed for this purpose.

These ships should be employed alternately throughout the year in cruises of about one month's duration.

The itinerary and schedule of operations for each of these cruises should be published well in advance by the commander-in-chief of the fleet to which attached.

#### SUGGESTIONS

In line with these two quotations and the Department's invitation, I respectfully submit the following suggestions:

1. Abolish training stations and substitute receiving stations and training ships (augmented, of course, in time of war, with temporary training camps).

2. Abolish receiving ships afloat, and substitute receiving barracks.

3. Remove trades schools from industrial navy yards, and concentrate the trades schools' activities ashore at the reserve bases or the receiving stations.

4. Revise curriculum of trades schools to provide: *Theoretical Instruction ashore*, illustrated with models and supplemented by visits to industrial plants; and *Practical Instruction at sea* in training ships, repair ships, tenders, hospital ships or store ships.

5. Limit the activities of the Ninth Naval District to administration and training of naval reserve force, recruiting, inspection, supply and transportation.

6. Operate *Recruit Training Ships* from the two main naval bases only, namely: Hampton Roads and San Francisco.

7. Re-organize the naval reserve force in two classes only, namely: First reserve and second reserve.

8. Organize the first reserve in ship units and definitely assign them to the billets they are to fill in the reserve ships if called to active duty in case of national emergency.

9. Pay retainer pay to the first reserve only.

10. Operate "Ships in active reserve" for naval reserve force training from all reserve bases. (This includes the recruit training ships mentioned in suggestion No. 6.)

### TRAINING STATIONS

My first and paramount suggestion is that training stations as such be abolished, and that the land, buildings and plant equipment thus released be converted to other naval purposes or otherwise disposed of as may be considered most consistent with the requirements of the national budget.

The service now rendered by training stations would better be accomplished by two separate activities in time of peace, namely, receiving stations and training ships; augmented in time of war by temporary training camps located preferably at lakes or harbors near various centers of population throughout the country.

The money spent in operation and maintenance of existing training stations and now appropriated for the construction of a new training station at San Diego, California, would give greater return in efficiency if invested in receiving stations at the principal bases or centers of naval activities and in the operation of a few more ships in commission.

The personnel released would be more effectively employed afloat, and the recruits would be better trained while being used to operate training ships. The truth of this last statement will be apparent to the reader when he has read all I have to say.

### RECEIVING SHIPS

The contention that it is cheaper to construct and operate quarters and messing facilities on shore than to convert obsolete ships and operate them as receiving ships admits of no argument.

I suggest that the existing receiving ship activities be concentrated in one receiving barracks at each of the naval bases or centers of naval activities. By this I mean concentrated at a suitably selected site in a port that is used for the operation and mainte-

nance of a fleet or unit thereof, the principal factors governing the selection of such site being proximity to transportation terminals and to the usual anchorage ground of naval vessels.

The reasons for maintaining receiving ships at navy yards, regardless of whether such navy yards are located at such natural centers of naval activities as I have just described above appear to me to be purely reasons of expediency. They are:

(a) To provide quarters, pay and subsistence for enlisted personnel necessary for the operation of yard craft and other navy yard activities under the captain of the yard and for operation of radio stations at navy yards.

(b) To provide a commanding officer for such enlisted personnel who, by virtue of his status as commander of a naval vessel, is empowered to order summary courts martial and deck courts, thereby relieving the commandant of the details of administering justice by personal investigation of and punishment for minor offenses.

Such simple difficulties of administration and discipline as these can easily be overcome by:

(a) Empowering the captain of the yard to convene summary courts martial and deck courts under the authority of the Act of August 29, 1916.

(b) Carrying the enlisted personnel pay accounts on the rolls of the yard disbursing officer.

(c) Commuting the ration allowance and permitting the men to subsist themselves at the yard cafeteria.

(d) Quartering them on yard craft or in houses on shore under the supervision of the captain of the yard.

#### TRADES SCHOOLS

I suggest removing trades schools from industrial navy yards; concentrating all trades school activities of a district at a reserve ship base, or at or near the site selected for receiving station or barracks; limiting the courses at these trades schools ashore to theoretical and academic instruction; and completing the courses by practical instruction afloat. I consider that the atmosphere and environment of the industrial navy yards are most unsuitable and undesirable, and, through their influences, are especially detrimental to the discipline, application and well-being of enlisted men under training or in trades schools.

Thus far my suggestions may look like a policy of destruction. I now come to the constructive part of my first and paramount suggestion, namely: to abolish training stations and substitute receiving stations and training ships.

#### RECEIVING STATIONS

Receiving stations should be maintained at the main naval bases for the purposes of receiving, detention, outfitting, housing, subsisting, paying, administering of justice and discipline in connection with, and discharging or releasing of all transient personnel, both officer and enlisted, passing through the base.

Briefly, the facilities of a model receiving station would include the following:

1. Administration building.
2. Quarters for commanding officer and heads of departments.
3. Quarters for transient officers.
4. Quarters for station crew.
5. Receiving barracks for recruits with parade ground and tent platforms for emergency expansion.
6. Receiving barracks for incoming enlisted transients or casuals.
7. Mess hall.
8. Draft house for outgoing drafts.
9. Sick bay and dispensary.
10. Club.
11. Swimming tank.
12. Target gallery.
13. Boat harbor with boat house and marine railway for small boats.
14. Wharf with suitable depth alongside for accommodating tugs and other small craft used in transporting drafts.
15. Power house and small shops.

#### TRAINING SHIPS

Referring again to my article on "The Relation of Personnel to Matériel" and particularly to the pages 1004 and 1010 as quoted in the early part of this paper, I suggest the following system of recruit training:

At the reserve base of a main naval base, or at or near the receiving station of such main naval base, *i. e.*, at Hampton Roads and

at San Francisco, maintain two capital ships "in active reserve," or two groups of such ships if recruiting activities warrant it, for training purposes.

Send these ships on training cruises alternately throughout the year, the length of cruise to be that which is determined to be necessary to produce the degree of training required, probably about one month.

These cruises to be open to members of the naval reserve (see page 1010, "The Relation of Personnel to Matériel") as well as to recruits under training for the regular navy and to students to complete the practical courses of trades schools.

Recruits arriving at the main base receiving stations would be outfitted, passed through detention, and taught the manual of arms, elementary naval terms, salutes and customs, semaphore, swimming, infantry drill and target gallery practice. They would remain at the recruit barracks not less than three weeks (period of detention) and not more than one month (unless held as a punishment) before embarking on one of the training ships.

After arrival on board the training ship they would remain in port not less than one week and not more than one month (if the cruises were of one month's duration) before putting to sea for their training cruise.

During this one month trick in port the men assembling for the cruise would be organized, assigned billets, and instructed in ship duties.

From the training ships they would go directly to ships of the fleet or back to the receiving station, as transients if they desired to avail themselves of the 10 days leave allowed recruits upon completion of training, and as students if they enlisted for one of the recruit trades schools.

#### NAVAL RESERVE FORCE

Suggestions numbers 7, 8, 9 and 10, although coming under the general subject of "Naval Training," are a little beyond the scope of this paper. They are covered more fully in my paper on "The Relation of Personnel to Matériel," and will be made the subject of a future paper, but are reiterated here because I believe they are in line with the Department's expressed desire for suggestions that may lead to economy and because I believe that the naval reserve

force should be maintained and trained for the specific duties its members are to perform in time of war or national emergency.

### CONCLUSION

These suggestions are intended as the basis of a policy and not as arbitrary or set rules to be followed explicitly in all cases. For example, it may be more economical and expedient to continue receiving ships afloat at certain stations. Also it is not intended to propose moving the seamen gunner's schools (torpedo and deep sea diving classes at Newport and ordnance class at Washington).

I give hereunder my views as to the merits of and results to be expected from the proposed system in comparison with the present system of recruit training. These views are based especially on my experience as commander of a reserve torpedo flotilla voluntarily engaged in training the naval militia of California, 1912-1914; as senior engineer of the U. S. S. *Pittsburg* engaged in training petty officers and reservists for the fleet while cruising the South Atlantic, 1917-1918; as executive officer of the U. S. S. *Ohio* engaged in training recruits while operating in the Chesapeake Bay and "behind the net at Base Two," 1918; and more recently as executive officer of the U. S. Naval Training Station, San Francisco, California, during the various drives and demobilizations of the past year.

### AS REGARDS MORALE

Under the present system recruits are kept too long on training stations ashore. Many men at last give excuses for misconduct, overstaying leave, jumping ship, etc., that they wanted to get away and go to sea and had become restless, disappointed and disgusted.

Although the period of training is supposed to be 12 weeks for firemen and 16 weeks for seamen, some men are inadvertently or through necessity held for much longer periods to the detriment of their morale.

The consensus of opinion of the officers of the drill department at this training station (San Francisco) is that the average recruit is at his best as regards morale and aptitude for absorbing recruit knowledge at the end of about one month's training, and from that point he goes down hill in this respect until transferred to a ship.

The effect of the proposed system would be to keep up interest throughout the entire period of training. At the end of three to

four weeks period of detention and training at recruit barracks the men would be on tip toe with anticipation and curiosity. Once a week, say every first, second and third Monday, a batch of recruits would leave the recruit barracks to join their training ship. Those finishing detention after the third Monday would have to wait over for the next ship until the first Monday of the next month, but during this wait could be given special liberty privileges. Do you think there would be any over-timers or laggards on Monday morning? Would any more severe punishment be needed for minor offenses at recruit barracks than "one week extra detention"?

During the next one week to one month period of training on board ship while organizing and preparing for sea the men would be constantly on the qui vive and in a receptive and inquisitive mood, ready to absorb every bit of information and instruction given them about their ship, nomenclature and purposes of its parts, ship's data, etc. Even the late comers would derive benefit from the instruction given the more fortunate earlier arrivals, through their greater inquisitiveness and desire to catch up with their better-informed shipmates. During this period some infantry and artillery drills and perhaps some small arms target practice could be held ashore, and during the last week some boat drill under oars.

Then comes the cruise, the very thing those youngsters enlisted for! The promises of the recruiting posters are being fulfilled! Liberty occasionally in a strange port! Boats under oars and sails! Fishing and swimming parties! Some elementary form of target practice with the great guns!—perhaps just a few rounds to show them what it is like.

Think of the mutual benefit to be derived from their association with the members of the naval reserve force who are also taking the cruise as their shipmates under identically the same instruction and training. Also from their association with the selected class of men who are taking these cruises for the practical end of their course of instruction at the recruit trades schools such as: yeomen's school, hospital corps training school, signal school, bugler's school, musician's school, preliminary radio school, mess attendant's school and commissary schools.

The artificers, machinists, electrical, optical and other technical trades schools (except seaman gunner's and radio) of course would complete their practical courses on repair ships and tenders; the



storekeepers school (?) on store ships; and the aviation mechanics on airplane carriers or seaplane tenders.

Think of the "class spirit" and resulting association and lasting comradeship that would be engendered and fostered among those who had taken part together in one of these cruises. Men would reckon the beginning of their naval careers from the dates of these first cruises, as—"I joined with the Pacific class of August, 1921."



Most young recruits join the navy with the idea of becoming real man-o'-war-men. The height of their ambition is to go to sea in a modern battleship. How many would sign up for a first enlistment if they realized that they might have to go from the training station to an auxiliary cargo ship, a collier, a "beef boat," or a district tug, and might even have to spend their entire enlistment on that kind of a "packet"? Some men may prefer that kind of duty later on, but recruits do not enlist with that in view.

Upon returning from one of these training cruises, the recruits would have seen just enough of the real navy to clinch their determination to remain man-o'-warshipsmen. By giving them the privilege of 10 days recruit leave with travel time to their homes, every one of them who availed himself of the privilege would become an enthusiastic recruiter.

#### AS REGARDS EFFICIENCY

Before going further I want to make one more suggestion or recommendation that has also some bearing on morale. Did you ever watch a draft of men (the bluejackets call them "Asiatics") arriving at San Francisco from the Asiatic station? Or did you ever stand at the corner of 96th Street and Broadway and watch a bunch of bluejackets just ashore for their first liberty in New York after a cruise in the South Atlantic or the Mediterranean? How clean cut, neat, happy and *self-reliant* they look! They are efficient man-o'-warshipsmen, and a big percentage of them are going to come back and reenlist before their four months are up—not because they like foreign duty, but because they like the navy and want to try a trick in the home fleet for a change.

*I urgently recommend a policy of sending recruits direct to a foreign station when they finish their period of training. Limit a tour of foreign duty to two years and thereby, so far as practicable, give all first enlistment men a chance at it.*

*The younger officers and men of the fleet do not seem to appreciate and some probably do not approve of the training that is given recruits after the first month at a training station. Two recent incidents will serve to illustrate this: A parade was forming for a local celebration and two battalions were drawn up on opposite sides of the street and both facing west. The battalion in front was from the fleet. The rear battalion consisted of recruits from the training station. The fleet battalion was presumably at "rest," as the next command given was "attention" and not "fall in." The training station battalion was "at ease." In either case the men should keep one foot in place and maintain their position in formation. The men from the fleet were engaged in guying the recruits, laughing and talking and passing such remarks as "Rookie," "Boots," etc. The officers of the fleet battalion, who were nearly all senior to the officer commanding the recruit battalion, seemed to be getting a good deal of enjoyment out of the*

performance. The recruits maintained their military bearing. Finally the recruit battalion commander lost patience and approached one of the fleet company commanders, and the following conversation ensued:

Fleet company commander (Lieutenant) (starting the conversation): "A recruit's a recruit, isn't he, and always gets some razzing?"

Recruit battalion commander (Junior Lieutenant) (replying): "Yes, I suppose so. The sad and unfortunate part is that they don't stay a recruit. If you will take a careful look at my battalion you will notice that they are all in neat, clean, proper uniforms and conduct themselves as a well-disciplined organization. I shall probably see these same men ashore in a parade in six months from now, and instead of a clean, neat, snappy organization as they are now, they will be a slouchy, non-regulation, poorly disciplined outfit like that there!"

The company indicated was immediately brought to "attention."

I can vouch for the truth of the above incident, but not the following, which was brought to me as hear-say and is merely given for what it is worth as indicating the attitude of the fleet, and the resulting influence on the recruit who cannot comprehend the necessity for strict military discipline and strict enforcement of uniform regulations at the training station.

A captain had arrived to command a battleship. Just before his first inspection of the crew a large draft had arrived on board from the naval training station. They were absolutely correct as regards regulation uniform (Paymaster's issue) and had complete and immaculately clean bag outfits (I can vouch for this part) when they left the training station. The executive officer of this ship had been trying for some time to get his crew into regulation uniforms, and was rather chagrined at this inspection to see so many of his older men still wearing non-regulation tailor-made clothes. He was about to apologize for them to the new skipper, when much to his surprise the latter pointed out the recruits and commented unfavorably upon the appearance of their uniforms. Needless to say, the executive passed the word that thereafter it would be the policy of that ship to encourage the wearing of "good looking" (?) tailor-made clothes.

Next time the fleet is in port see if you can find any seamen second-class or firemen second-class on liberty. You probably

won't be able to see their stripes at all on account of their long tight-fitting non-regulation sleeves, which hang down so far as to completely hide their cuffs. Ask them to pull up their sleeves and you will find them all wearing three stripes—all seamen or firemen first-class!

The above illustrations are not intended as a criticism of the discipline of the fleet, but are given to illustrate my point that the recruit training (after the first month) could be better accomplished on board training ships, which, as a part of the fleet, would be under the same regulations and would therefore serve as models as regards military bearing and uniform.

Strict military discipline and enforcement of uniform regulations are necessary at training stations, yet a very difficult problem is presented to the officers and instructors of the training station because the recruits all know the attitude of the officers and the men of the fleet, and naturally they adopt the same attitude themselves, not only towards the uniform regulations of the training station, but unfortunately towards most of the other instruction given them there. They say to themselves: "What's the use, we won't have to do this when we get on board ship?"

Would it not be better to give them most of their training on board training ships, where, instead of being a laughing stock, they would be a model for the rest of the fleet?

To my mind the strictly regulation government issue uniform or a tailored replica of it as regards pattern, cut and color, is far neater and better looking than the outlandish creations produced by the waterfront shysters and affected by most of the "sea-going" (?) bluejackets.

#### AS REGARDS ECONOMY

I have already briefly pointed out some of the larger economies that would result from (a) abolishing training stations, (b) abolishing receiving ships afloat, (c) concentrating receiving, training, and trade school activities, and (d) removing military activities from industrial navy yards that are not located near the natural centers of naval activities. I might go into further details and stress such small economies as saving in transportation, communication, etc., that would result from (c) and (d).

But there is one big economy that should weigh above all others, because it bears also on the efficiency of the whole navy. *Several thousand men and over two hundred officers would be released*

*from shore duty for service in the fleet, and the capital ships thus manned for training purposes would add at least four (two on each coast) effective units to the strength of the active navy.*

When we tackle something new, let us do it right and wholeheartedly. Cut out the expediency, especially the political kind. If we happen to be from the vicinity of Great Lakes, San Diego, Newport, Vallejo, New Orleans or Bremerton, and it comes to a choice between our loyalty to our home locality and the best interests of the navy, let us always remember that we are naval officers first and that the best interests of the navy are the best interests of our country.

“Efficiency with Economy”—Efficiency for the navy and Economy for the National Budget! It is up to the navy, and that means you and me. If you believe with me, or have some better suggestions of your own—get busy! It is now up to you. *The Department invites your suggestions.*



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## PRINCIPLES OF COMMAND<sup>1</sup>

By REAR ADMIRAL LLOYD H. CHANDLER, U. S. Navy

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### GENERAL CONSIDERATION

Professor Fulton defines expository writing as being "that kind of writing which has as its primary function the impartial unfolding of any phenomenon, hypothesis or generalization to the understanding of the reader." The subject here presented for consideration is "*The Principles of Command*," and we therefore have before us an attempt at expository writing which requires that we shall take this term and attempt to set forth "what it is, what are its essential qualities," and "into what kinds it is divided." When, however, we attempt to state "how much it includes," "what it excludes" and "how it differs from other similar ideas," we shall see that it is an all-inclusive term, in that it includes, to a certain degree at least, "all other similar ideas"; that is, it in a measure includes elements of all ideas that are similar to even a remote degree. Therefore the point as to "what it includes" and "what it excludes" can only be covered in a practical way by saying that the principles of command include in a certain degree every principle not widely divergent in character, and that they entirely exclude only such totally divergent principles.

We have an idea to discuss, not a concrete fact, and the first step therefore necessarily becomes one of analysis in order to detect the several elements upon which rest the principles that underlie the power and ability to command. If we do this, and consider each element in turn, we may be able, first, to determine upon what requirements the power and ability to command are based; and then, proceeding synthetically, we may also succeed in envisaging

<sup>1</sup> This paper is prepared by reducing and summarizing a thesis on the same subject prepared by the author in March, 1920, when a student at the Naval War College.

the character and type of man who may be expected to succeed to a high degree in the exercise of command.

### POWER AND ABILITY TO COMMAND

The power and ability to command consist of the power to employ men, materials, and natural forces successfully to produce certain desired results. This statement is broad in scope and covers most human administrative activities; it applies to the work of the administrative head of a railroad, of a manufacturing establishment, etc., as truly as it does to a military officer. For purposes of present discussion, however, we will consider only the principles of command as applying to the naval service.

Before proceeding further it will be well to point out the difference in meaning between the two words used above; namely, the *power* and the *ability* to command. Generally speaking the two words might possibly be considered as synonymous, but the writer prefers to consider *ability* as referring more especially to possession of knowledge and of the technical skill to use it, and *power* as referring more particularly to that strength to act and force of character without which knowledge and skill—that is, ability—are of little value. Under these definitions, therefore, the first of our requisites for command is knowledge and that technical skill to use it without which its possession is of no practical value. This is of course a function of the intellect, and the writer has therefore sought to segregate this special idea by his use of the word *ability* to command. This idea is essentially static, and for this attribute to be of practical value to the possessor this *ability* must be set to work; that is, it must *move*. It is to the quality which establishes and maintains such movement that the writer has applied the word *power* to command.

### THE RELATIVE IMPORTANCE TO OFFICERS OF HIGH AND OF LOW RANK OF AN UNDERSTANDING OF THE PRINCIPLES OF COMMAND

As the development of the discussion proceeds, it will be noted that the principles involved apply alike to all officers and men possessing any degree of authority and responsibility whatever. The only difference between an officer of high rank and a junior officer or petty officer, so far as the principles of command are concerned, is one of degree and not of principle; the senior must know



and adhere, to the highest degree possible, to *all* the principles involved; whereas the junior may successfully perform the lesser duties that fall to his lot with a far less extensive knowledge of and a far less degree of compliance with such principles. Now as every junior hopes in time to become a senior, it is at once apparent that such junior, as a fundamental part of his task of preparing himself for advancement, should from the beginning consistently endeavor to increase his knowledge of the principles of command and his skill and power in applying them.

In view of the statement made above that the requirements for command are in principle alike for all persons in authority in the naval service, varying in different cases only in degree we may appropriately conduct the discussion of the principles of command mainly from the point of view of the officer of high rank. The one such officer who more than any other is so placed as to require for the successful performance of his duty the highest power and ability to command is he who acts as the commander-in-chief of a large fleet, and this thesis will therefore deal primarily with the principles of command from the point of view of such commander-in-chief.

#### NECESSITY FOR THEIR BEING UNDERSTOOD AND APPLIED

It need hardly be argued that, in order to be successful in the exercise of any degree of command, it is necessary for the officer or man exercising such command to comply with the principles underlying such command to such degree as is required by the extent of the command. Some men exercise command successfully without greatly considering this subject and perhaps without any really logical understanding of it—such men are born leaders of men and comply with the principles intuitively. That this may have been possible in some cases cannot be accepted as a sound argument that the study of the principles of command may safely be neglected; in fact, it is most probable that such successful commanders have only *seemed* to neglect the study of the science, and have simply failed to leave any considerable record, whether verbal or written, of their thoughts and studies in regard thereto. Be that as it may, it cannot be gainsaid that the born leader will have his peculiar powers enhanced by such study, while the less gifted man may thereby enable himself to pass the line that lies between failure and success.

## NATURE OF THE FORCES TO BE COMMANDED

As has already been said, the first step in any discussion conducted for the purpose of determining the principles underlying any particular activity must be one of analysis; the activity in question must, if possible, be resolved into its constituent parts in order that the underlying principles may be discerned and separated one from the other for discussion. In submitting to this process the thought expressed by the phrase *principles of command*, we realize that there are three classes of forces which a commander-in-chief must endeavor to control or command; they being:

1. Forces of nature.
2. Forces flowing from the use of material.
3. Forces flowing from personnel.

Of course it is impossible to really command natural forces, and in implying such command we mean the shaping of our designs in such a manner as will cause them to be served by such natural forces. So we act when we direct our sailing route to take advantage of known or expected weather conditions, current, etc. The forces flowing from material are also subject to actual command in slight degree only. Material is used as a means for directing existing natural forces along certain lines so that they will become useful to us, as when we use the machinery plant of a ship to transform the energy stored in the fuel into propulsive energy applied to the ship. We can control or command such forces in a sense, it is true, but in exercising such control we must be guided by the natural laws governing their action. While the use of these forces as an element in war is a function of the commander-in-chief, the actual field of the fitting of material to so render natural forces useful is primarily that of the scientist, inventor, designer, and constructor, who furnish the material, and the part of the commander-in-chief is to understand the subject and to use such material effectively and within the limits of its capabilities. The forces flowing from personnel are those which an officer, be he commander-in-chief or other, can most greatly influence; command; control. By the creation of high morale, *esprit de corps*, loyalty, etc., he can exalt these forces to the utmost, and by failure to do this he can bring about disaster; thus Mahan: "Historically poor ships with good men have proved better than good ships with poor men," or words to that effect, and "good

men" are men of high skill, morale, and loyalty, and men well commanded.

#### KNOWLEDGE AND CHARACTER AS THE FUNDAMENTAL REQUISITES FOR COMMAND

Proceeding with our analysis of the requirements for command and of the duties of a commander-in-chief, we may conclude that the first requirements for such an officer must be:

- I. *Knowledge and the technical skill to use it; that is ability.*
- II. *Character; which includes the power to use ability.*

Upon a full possession of these two qualities depends the capability of any man for successful command.

#### KNOWLEDGE AND THE TECHNICAL SKILL TO USE IT; THAT IS ABILITY

##### ESSENTIALS OF KNOWLEDGE

It will no doubt be admitted without argument that, to be thoroughly successful, a commander-in-chief must have a high degree of knowledge of all the elements of his profession, and that the greater and more varied the extent of his professional knowledge, the better fitted he will be to perform his duties, provided he has the other requisite qualities. While it is well nigh impossible to prepare a list covering completely the field of knowledge over which spread the duties of a commander-in-chief, at the same time we may say that the principal subjects lying within that field are:

- a. *Policy.*
- b. *Strategy.*
- c. *Tactics.*
- d. *Logistics.*
- e. *Organization.*
- f. *Administration.*
- g. *Instruction and training.*
- h. *International law.*
- i. *Military law.*
- j. *The science of psychology.*
- k. *Creation and maintenance of high morale, loyalty, and military character.*
- l. *Principles of cooperation.*

- m. Character and temper of nations and peoples.*
- n. Higher command, including plan making and staff work.*
- o. How to acquire knowledge.*

The extent of the field of knowledge indicated by this list, incomplete as it must necessarily be, indicates in itself the impossibility of securing a perfect commander-in-chief, and shows why the life of a naval officer is all too short for the study of his profession. It is worthy of note that in the above list appears no mention of what are generally referred to as the "technical subjects"; by which is meant such professional and technical matters as the construction of ordnance, as the theory and practice of steam and electrical engineering, etc. The more a commander-in-chief knows of all these subjects the better able will he be to control the forces flowing from the use of material, but in detail they are matters that are habitually in the hands of his subordinates, and so they have not been included in the above list and will not be considered in this thesis.

#### TECHNICAL SKILL TO USE KNOWLEDGE

The mere possession of knowledge is of little or no value to the working man or to the cause which he serves. No matter how erudite a man may be, he is valueless unless he can transform his knowledge into useful action. Therefore in an officer we must have, not knowledge alone, but as well the knowledge of how to apply knowledge; that is, technical skill. A flag officer may know ever so well the contents of the battle signal book, but unless he can stand on the bridge and handle his command according to the doctrines and by the methods contained in that signal book, he is in reality no flag officer, but only a storehouse of knowledge, really useless to himself and incapable in the office which he attempts to fill; and not only useless, but in a fleet a menace and threat to that fleet and to the country which it serves. Therefore of an officer is demanded not only knowledge, but ability; that is, both knowledge and the technical skill to use it.

#### KNOWLEDGE OF POLICY, STRATEGY, TACTICS, AND LOGISTICS

Consideration of these four subjects will be omitted from this abbreviated paper, for, while there is much to be said in regard to each of them, they are perhaps better understood than some other phases of this question, and full discussion of them may well be omitted here.

### KNOWLEDGE OF ORGANIZATION, ADMINISTRATION, AND INSTRUCTION AND TRAINING

The remarks in the preceding paragraph apply to these subjects also, but in addition it may be well to state in this connection that fundamental organization and administration should be so perfected in time of peace that their operation will continue almost automatically in time of war, thereby relieving those in high command from every-day harassment at such times, and permitting them to concentrate their time and energies upon the immediate demands of war; and that organization and administration are merely means to an end and not ends in themselves; a fact that appears to be sometimes overlooked.

### KNOWLEDGE OF INTERNATIONAL LAW

Again we may omit any lengthy discussion, and simply invite attention to the fact that this knowledge should cover international law of the past as well as of to-day; of the force of precedents, of the possible effects of one's actions upon international law, of the power of international law to control one's actions, and of general and special treaties to which our country is a party.

### KNOWLEDGE OF MILITARY LAW

This knowledge should include not only the laws, regulations, and rules for the government of the navy, but the broader phases involving the relations of the navy with other branches of our government, and with civil territories and peoples, whether our own or alien.

### KNOWLEDGE OF THE PRINCIPLES OF PSYCHOLOGY GENERAL DEFINITIONS

Before proceeding with the discussion of the principles of psychology it is necessary to give some consideration to the meaning of the word, and we find the following as accepted definitions:

*Psychology*.—The science of the human mind or soul and its activities and capacities; the science that treats inductively of the phenomena of human consciousness, and of the nature and relation of the subject of them; mental philosophy. (Funk & Wagnall's New Standard Dictionary.)

*Psychology*.—The science of the mind; systematic knowledge and investigation of the genesis, powers and functions of mind. Under this head there are three subspecies, as follows:

1. *Individual psychology*, which treats the developed mind of the individual.

2. *Comparative psychology*, which is the comparative study of different classes of minds, and includes *animal, folk, race, and social psychology*, the latter including *criminal psychology* and the study of degenerates.

3. *Genetic or evolutionary psychology*, which is the study of the mind's development, and includes *child psychology* and the genetic studies of the various departments of comparative psychology.

There are other divisions of psychology, but they are of little importance in classification. (*Webster's New International Dictionary*.)

Of these two definitions the one given by *Webster* is the most illuminating for the purpose of this thesis, and it will therefore be accepted as the basis for discussion, modified, however, by one addition from the *Standard Dictionary* definition. *Webster* defines the word as being a science applying only to the mind, whereas the *Standard Dictionary* applies it to both mind and soul. The difference is perhaps a somewhat elusive one, but it cannot be denied that many decisions and actions flow from impulse or from some other source than reasoned mental processes. Whatever be the inspiring cause in such cases, whether we consider them as flowing from soul or from the mind, they are equally important in our study of command; it will be important for a commander, in his estimate of individuals or of classes, to be able to judge, not only what decisions and actions may be expected from others in any situation, but also, knowing the individuals or classes concerned and the existing situation, to be able to discern in advance whether such decisions and actions will be based upon reason or upon impulse.

In addition to the general study of the psychology of those with whom he will be brought in contact, as well set forth in *Webster's* statement of the subsiences, a commander-in-chief will have to give consideration to a number of special circumstances and classes with which he, as a naval officer in high command, must necessarily deal. This fact enforces some further elucidation in regard to each of *Webster's* subsiences, and some special application of them to naval conditions.

#### INDIVIDUAL PSYCHOLOGY

For the purpose of this thesis, *individual psychology* may well stand as defined, provided that we bear in mind that the individuals to whom consideration must be given are specially trained along certain particular lines, and that those lines are widely different from any known in civil life. Therefore the minds of naval officers and men may be expected to show numerous and very considerable

differences from those ordinarily covered by expert civilian students of psychology. It is for this reason that seafaring men as a rule are so little understood by their own countrymen; their habits and mentalities have been so different from those of civilians that they have occupied almost a separate world of their own. And it is only of comparatively late years that the seafaring population has ceased to be very mute in regard to itself; formerly nearly all of its members, even officers of the navy, were not given to writing or even to much study, and it is only within the latter part of the last century that the sailor has appeared in literature to any extent in anything except novels or similar productions. Being thus shut off from the world, little understood and little understanding outside of his own brethren, there grew up in the sailor a mental state very different from and very strange to that of a man whose life is spent ashore and free from naval restrictions. And in addition to the differences resulting from the sea life in itself, existence under those same naval restrictions and discipline produces a still further and a very great effect of a similar nature. While these differences are not to-day so marked as they formerly were, owing to the changed conditions of sea life and to the disappearance of the old-time sailor class as such, nevertheless such differences still exist to a very considerable degree, especially in those who have spent many years in the service, and they must be taken into account in the study of the individual psychology of the members of the naval profession.

#### COMPARATIVE PSYCHOLOGY

Also, *comparative psychology* with us not only stands as given in the dictionary definition, but must specifically consider the mental processes of the different grades and ranks, as of commissioned officers of command and of subordinate rank, of warrant officers, of chief petty officers, of other petty officers, and of rated and non-rated enlisted men. These are of course classes that do not exist in civil life, even though they may have somewhat equivalent divisions in certain professions on shore. Even where such divisions exist in civil life, the members of each of the several classes are not bound together by mutual interests and close association as they are in the navy. So, while such special classes are not considered in the dictionary, they must be given due consideration in any study of naval psychology. And in addition to the above special

classification we must consider the various corps involved, which include the line, the several staff corps, and the marine corps, each one of which has its own special traditions, habits of thought, interests, etc. Another line of division is based upon actual occupation, as of the deck force for both deck and gunnery purposes, the engineers, the electrical force, and numerous other groups arranged according to the branches of activity in which the individuals concerned are engaged on board ship. Then during the last war we had, as we probably will have in every future war, another most important division the conflicting elements of which must be reconciled; this being based on the different classes of personnel in regard to origin; namely, regulars, temporary officers and men, national naval volunteers, naval reserve force, etc. This last division, that based on origin, in itself furnished an ample field for no mean psychological study.

Not only must we deal with the psychology of personnel operating under the above subdivisions, but we are faced with the fact that many men, especially among the officers, deal, not with the activities of a single subdivision alone, but with more than one; indeed the captain of a ship, and, in a less degree, the executive officer, deal with *all*. And it is a curious fact, but true, that while a man's general characteristics of mind perhaps do not greatly vary under different conditions, nevertheless, when it comes to details, his mental attitude and methods may be very different in regard to one subject from what they are in regard to another, and in such a case the ability of the individual in the different subjects will vary accordingly. Thus a certain individual may be a quick and accurate thinker in regard to gunnery work, let us say, and slow and uncertain in regard to navigation; and similarly with regard to other branches. There are perhaps two possible causes for this, the first being the natural power of any given mind to master certain subjects more readily than others, from which will spring a greater interest in the former subjects and, no doubt, greater and better knowledge in regard to them. The second possible cause is that the exigencies of the service may have impelled the individual into certain studies and activities, which would result in greater knowledge and interest along those particular lines. In this latter case it is quite possible that the particular individual in question can, if opportunity be offered him or forced upon him by the demands of the service, show equal or even greater aptitude in other things. This perhaps



borders on individual psychology, but comes about as a result of the consideration of the numerous classes enumerated above under comparative psychology. However this may all be, the point at issue now is that, at any given moment; the moment at which the commander must deal with the individual in question; a certain mental attitude exists in that individual; an attitude based upon the past and present comparative classification of his mental activities; and it is this mental condition of the moment that it is important to understand, not only in regard to the possible use of the individual at the moment, but also in regard to the possibilities of developing him in other directions.

#### CRIMINAL PSYCHOLOGY

Under *comparative social psychology* we must consider *criminal psychology*, although fortunately in the naval service we do not have to deal with many real criminals. Still, as we have a special code of laws and regulations governing naval discipline, so we have a corresponding class of offenders against such special laws and regulations. While not criminals under the ordinary definition of the word, these men are offenders, and the study of their mental processes and reactions may be properly considered as a special branch of naval criminal psychology.

#### GENETIC OR EVOLUTIONARY PSYCHOLOGY

Under *genetic or evolutionary psychology* we have the development of the mind of the individual; perhaps for our purposes an already thoroughly developed mind along certain lines, but awaiting development along others as the individual endeavors to increase his fund of professional knowledge, as every good naval officer must constantly strive to do. The most frequent example of this condition is where an officer who has special knowledge in one particular branch is called upon to develop himself in and perhaps take charge of activities in another branch. Most completely typical of this is the change in mental activities and characteristics that must take place in a successful officer as he advances in rank. Starting as a junior subordinate, he has a certain limited sphere of duty, and he is expected to know everything about such duties in the most minute detail and literally to attend to the details of such duties himself. His principal pre-occupation must be with what he does himself, and only to a much less degree with the activities

of his few immediate subordinates. This condition results in certain habits of thought and methods of mind. As the officer increases in rank, however, the character of his duty broadens; more subjects come within his immediate purview, more subordinates come under his immediate control; and this change in conditions brings with it an enormously increased mass of detail, until it ceases to be possible or advisable for him to attend to all such details himself. He must then begin to effectively control and to rely on his subordinates for details and must begin to center himself less on what he does himself and more on what he causes others to do and directs them in doing. With this must come a corresponding change in his mental processes; a genetic or evolutionary change. Such a step, and a very great one, is that which occurs when an officer passes from subordinate to command position; when, as when becoming for the first time the commanding officer of a ship, he must include in his duties *all* the activities and *very few* of the details, and must rely upon his subordinates for the actual carrying out of nearly all such activities. The best captain is the one who, in carrying on his normal daily duties, *does little himself but causes much to be well done by others*. It is from a failure to accomplish this most important psychological change that many an officer who has been an excellent subordinate fails in the performance of the duties of command rank.

#### CHILD PSYCHOLOGY

Strictly speaking, *child psychology* should not enter into the naval question; and yet, while they are not actually children, nevertheless the extreme youth and in very many cases the great lack of education and mental training on the part of our recruits, do present to us a problem not far different from that presented by a real child. So from this point of view we may perhaps consider that the study of child psychology is one of our problems. In addition to the above condition with which we have to contend; that of youthful recruits with generally immature minds; we have another problem presented by recruits, whatever their age or previous mental training and development, that is in a sense not dissimilar to that presented by the mental development of a child. Such recruit is presumably entirely unfamiliar with the sea and with military discipline; in other words the life into which he is now to be inducted is as unfamiliar to him as is life in general to

the new-born child. His mind is absolutely devoid of all the knowledge and habits that we require it to possess in order that it may be useful to us. Therefore we will surely be not amiss if we consider that, while we are not dealing with child psychology literally speaking, nevertheless we are dealing with a mind that, regardless of the age of the individual, is the mind of a child so far as our particular purpose is concerned. The mind in question may be well educated, well trained, and well developed generally, and so be especially fertile for rapid special development in our particular branch; but otherwise, for our special purpose, it has little advantage over that of a child. Hence it is not far from the truth to consider that the principles that should underlie our training system for recruits of all ages should be similar to those of child psychology, modified as may be necessary to meet the condition of an older body and of a mind developed to a greater extent than that of a child in regard to things other than those which we now wish to teach.

#### SUBJECTS FOR PSYCHOLOGICAL STUDY

Having presented some general statements in regard to psychology, and having enumerated some special classes to which a naval officer should give psychological study, it becomes necessary to set forth some arguments as to why such study should be given and as to what results should follow it. In stating that one item of knowledge that should be possessed by a commander-in-chief is that which relates to the principles of psychology, it may be said that his studies in this branch should refer to our own and to foreign peoples, governments, and officials, both civil and military; and especially so far as concerns:

1. Seniors in command.
2. Equals in command with whom he may be called upon to cooperate, whether they be naval, military, or civilian; whether of our own or of foreign nations; that is, associates in command.
3. Subordinates.
4. Himself.
5. Enemy high officials and naval and military commanders against whom he may be called upon to operate.

#### PSYCHOLOGICAL STUDY OF SENIORS AND ASSOCIATES

In regard to this phase of the matter it may be said that the purpose in view in regard to such friendly elements is to bring

about mutual understanding and coordinated action. To do this each must understand the other, and in conference all must finally reach a common conviction in regard to the subjects at issue. In one form or another, such as are interested must meet, each must present his views and beliefs, and from this interchange must come a final decision; accepted and believed in by all; from which can flow coordinated action. It is evident that to accomplish this each must know the mind of the others. And although the character of the situation changes according to the subjects of the conference and the character of the participants in it, as well as with the manner of the conference, it may justly be claimed as generally true that the main object of such conference is for each member to present correct and strong views, to convince others that such views are correct, to display his mind for the benefit of the others; and, on the other side, to become convinced by argument when he holds any mistaken views, to have any such views corrected by argument and the presentation of additional information, and to benefit himself by the mental displays of others. Only by some such process can coordination and cooperation be successfully accomplished. Now a commander-in-chief is presumably a man properly qualified to command, and his beliefs and conclusions are entitled to great weight when he sits in high council with those by whom he is commanded and those with whom he must act in conjunction. Therefore it is most important that the commander-in-chief shall at such times be able to present his views in such a way as to command respect and to secure their adoption unless some wiser senior or associate can either show that such views are faulty or else propose something better. A man cannot do this unless he knows the psychology of such seniors and associates and understands how best to approach each one of them; one particular argument or line of reasoning will convince one type of mind and have little effect upon another.

#### PSYCHOLOGICAL STUDY OF SUBORDINATES

So much having been said in regard to the psychology of seniors and associates, we may now speak of the subject as referring to subordinates. Here the principles as laid down above still apply, but somewhat differently. It is true that a commander-in-chief, or any other officer, if he is to secure good results, must in some manner convince his subordinates of his wisdom and sound judg-

ment, so that they may with confidence support and obey him. This means the creation and maintenance of high morale and loyalty within his command, and the first step in accomplishing this is to convince his subordinates that he possesses in a high degree the qualities requisite for high command; in the words of the Articles of War: "to show in himself a good example of virtue, honor, patriotism, and subordination," wherein the writer believes that the law attempts to summarize the qualities that should be possessed by every officer in high command. Now the convincing of one's subordinates depends upon personal contact and argument, so far as a commander-in-chief is himself concerned, with only a very limited number of individuals; he deals personally with a few force, squadron, and division commanders, his own staff, etc., and the only way in which he reaches his lesser subordinates is through those others, and by his general attitude and measures. Now if a commander-in-chief can in the first place create a feeling of confidence in himself on the part of his subordinates, which means morale and loyalty, he has thereby acquired over them a large measure of that influence which he seeks to obtain. Having their admiration and respect, they are disposed to accept his measures more or less without question; which means that, having once convinced them that he is worthy of command, it is as a rule not necessary for him to convince in regard to individual measures. And this favorable situation goes further back than this, for, in the case of an officer who is not unfavorably known to the service at large, the very fact that he has been ordered as commander-in-chief arouses in his subordinates a predisposition to assume that he is worthy to hold the office. These two facts make the situation most advantageous for him who has the desire, skill, and tact to make use of the favorable elements to the utmost. The difference between this case and that in which an officer deals with seniors and associates is manifest, and is that, in dealing with those others it is necessary to convince by argument and sound presentation of each individual case; only in rare instances can one hope to carry such others with him by the strength of their favorable feeling for him; whereas, with his subordinates, when once he has instilled into them the proper feelings of loyalty and respect and the desired high morale, their feeling for him will cause them to accept as a matter of course and loyally to support his measures, and will make them desirous, not only of understanding,

but of foreseeing and meeting his wishes even before they are expressed.

#### . PSYCHOLOGICAL STUDY OF SELF

It is evident from what has already been said that, in order to know others, a man must first know himself ; that is, his psychological study must begin with himself. Unfortunately this particular branch of psychology, which is one of the most important if not the most important, is the one that is most apt to be neglected, especially by the young. Unless the habit of self-inspection and self-study begins in youth and continues through life, it is little apt to be taken up in later years. And youth is little given to introspection ; is too apt to give little thought to its own actions. If, of two captains, one has an efficient and happy ship and the other the reverse, it is generally the case that their subordinates and those others who are aware of the conditions, will accept the result as being caused by certain qualities natively inherent in the two men ; they will think that one captain was born with the qualities requisite to produce the good results and that the other was born without them ; that the results actually achieved were inevitable and consequent upon conditions that came into existence when the two men were born. Now if those two men, during their preceding years, made no psychological study of themselves, this point of view is doubtless correct. If, however, any man makes a proper study of himself, it may well be that he may remedy defects existing naturally in himself and thereby achieve success instead of failure.

#### PSYCHOLOGICAL STUDY OF YOUNGER OFFICERS

In his dealings with his subordinates, the writer has found that one of the greatest difficulties with younger officers and with enlisted men is to get them to really think, and his first effort has always been to attempt to stir them to mental action, and to guide such action in appropriate directions. So far as the men are concerned, the usual newspaper published on board most large ships furnished a good medium for reaching their minds, and much can be done by properly worded notices and orders, and by training the officers to stir the men to mental activity. For the officers, the writer has made continuous efforts in the same direction, through close personal association, by constant carefully considered conver-

sation with officers on the bridge and elsewhere, and by the preparation of treatises, etc., on various subjects which he has endeavored to get into their hands in such shape and by such methods as will arouse their interest and avoid repelling them by the appearance of preaching.

#### PSYCHOLOGICAL STUDY OF ENEMY OFFICIALS

A most important phase of the question is the psychology of those foreign officials against whom a commander-in-chief is apt to find himself opposed in time of war, which would of course mean primarily the commander-in-chief and other high officers of the enemy's navy. To know their habits of thought and to understand their probable reasoning and conclusions in any given situation is manifestly one of the greatest assets that a commander-in-chief can possess. Therefore information as to the character of such officials in all foreign navies should be eagerly sought at all times in preparation for possible war, and, as well, should be studied the doctrines and habits of thought that generally find favor in each such navy. It is perhaps needless to add that here is a place where great caution is necessary if we would avoid error, and perhaps fatal error. It is hard enough to reach sound psychological conclusions in regard to our own people, even our own fellow officers, and when we come to study even the civilian mind of our own countrymen we find greatly increased difficulty in being sure of our conclusions. And this difficulty is greatly enhanced when we attempt psychological research among alien personalities, even of related races; and when the race under investigation is not only alien but a member of one of the great divisions of the human race differing widely ethnologically from our own, then we must indeed accept our conclusions only with the greatest diffidence, and must suspect that any conclusion that we may reach is very apt to be erroneous.

#### THE APPLICATION OF THE PRINCIPLES OF PSYCHOLOGY AND THE RESULTS SOUGHT BY THE APPLICATION OF THOSE PRINCIPLES

From what has been said it will be perceived at once that, in the study of psychology, we are seeking a means to an end. That end is two-fold in its nature; on the one hand it is the understanding

of the mental conditions and mental processes of those with whom we have to deal in order that we may either bend their thoughts and purposes into channels along which we think they should flow ; or else, on the other hand, it is to understand them and, after we have so far as practicable induced them to accept our point of view, to otherwise accommodate our own mental activities to theirs, while at the same time building up in such associates a desirable frame of mind and will. Under this last head comes the creation of morale. This all means that, by a given means ; the application of the principles of psychology ; we desire to attain a certain end ; the acceptance of sound purposes and the creation of high morale. We have discussed psychology at some length and in so doing have familiarized ourselves with the *means*, and in subsequent discussion we will consider the practical application of this means to attain the desired *end*. Before proceeding to do this, however, one further remark seems applicable, and that is that in all dealings with personnel, of whatsoever nature, psychology enters as a controlling factor. The giving of a simple order ; even the tone of voice in which it is given ; has a psychological effect upon the hearer—an effect that may be of the first importance. And this is equally true of personal actions ; the manner and bearing of an officer in an emergency are important to the utmost limit because of their psychological effect upon those around him. Therefore, every thought, every word, and every action should, consciously or unconsciously, be in accordance with correct psychological principles if we would attain a maximum of success in our relations with others, be they seniors, associates, or subordinates.

#### CLASSES OF MEN AND MINDS

It is difficult to reduce men and their minds to any simple classification, and any such effort must be only moderately successful and full of flaws, but nevertheless it will be well to briefly touch here upon this point. In general, and without special discussion, we may say that we have, or may have :

1. *Geniuses*.—Such are rare ; they are an abnormality. When the abnormality works beneficially the individual in question is hailed as a genius ; when it works in the other direction we put him in the mad house. “ Genius is akin to madness.”

2. *Men who just fail of being geniuses*, but who in attainments and performance stand very high ; the class bordering on genius.



In this class there may be men who fail of genius simply because opportunity does not knock at their doors.

3. *Men well above the average in attainments and performance.* These are they upon whom must fall our main burden.

4. *Men average or thereabouts,* upon whom we must depend for the performance of the greater part of the subordinate duties, for such men compose the great majority in any organization. It is hopeless to expect good results from them in any but subordinate positions, and the psychological problem becomes to get the best out of them that they are capable of producing, meanwhile supplying them with the necessary guidance and inspiration.

5. *Men somewhat below average, but not enough so to keep them from being useful in a limited sense.* Such men must be used for what it is possible to get out of them; the problem is to know what they can do, to get them to do it, and to avoid letting them get into positions where more is demanded of them than they are capable of producing.

6. *Men so far below the naval average that they can be of little or no use—failures.* Fortunately we have not to deal with any great number of these. The problem is first to recognize them, and then to get rid of them, for they are not only useless, but a menace—there is always danger that one of them will inadvertently be placed in some position where something of importance may directly or indirectly devolve upon him, and failure will then result.

From this statement our psychological problem of organization becomes apparent. It is to recognize and select from among our personnel, the men who constitute each of the above classes, and to fit each one into the organization in such a way that his faculties and powers will be given the fullest possible play, without in any case placing any man in a position such that the load thrown upon him will exceed his ability and power to carry.

#### QUALITIES OF MIND NECESSARY FOR LEADERSHIP

From a psychological point of view it is readily deduced from what has already been said that, among the leading qualities of mind necessary for leadership, considered as qualities of mind purely and not as qualities of character, are:

*Receptivity*—the power of receiving and assimilating.

*Quickness*—the power of receiving, assimilating, and drawing conclusions rapidly.

*Accuracy*—the power of receiving, assimilating, and drawing conclusions correctly.

*Judgment*—the power to discriminate correctly and wisely; to correctly differentiate between the practical and the impracticable.

*Stability*—firmness, constancy, steadiness, singleness and tenacity of purpose, persistence, pertinacity, patience.

*Courage*—spirit, confidence, self-reliance, resolution.

*Imagination*—originality, inventiveness, inspiration.

*Initiative*—power to conceive and to execute without prompting from without.

*Skill and ability to inspire other minds.*

It is difficult to prepare such a list as the above and in doing so to differentiate between qualities of mind and of character; mind and character are inextricably interwoven. Nor can any such list be complete. As given above, however, it may be accepted as a partial list indicating the fundamental characteristics of mind upon which character, especially military character, and command efficiency must rest.

(TO BE CONTINUED)

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## COMMUNICATIONS AFLOAT

By LIEUT. COMMANDER MAHLON S. TISDALE, U. S. Navy

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NOTE.—In early May, 1921, a high ranking officer asked me to write him a letter commenting on communications, with special reference to radio, in order that he might incorporate such of my views as he believed sound into the communication organization of the unit under his command. I was at that time a staff communication officer (radio). In an attempt to emphasize the effect of good communications on the efficiency of gunnery—the backbone of any naval offense—and upon our general readiness for war, the letter was written as requested. The following article is a revision of that letter and is published in the hope that some good may result, in that—if in no greater way—it may draw added service thought toward communications.

Why is it almost a service custom to give gunnery precedence in personnel and in schedules? Because gunnery exercises are held in competition. A good gunnery ship is known as a good ship. Her scores are published to the service. She is a success. But what of the rest of the ship? It is probable that a good gunnery ship is a good ship in every way, but not necessarily so. A good ship at S. R. B. P. might be a failure in battle through previous neglect of other equally important coordinate branches in the interest of improving gunnery.

Of what avail is good gunnery, or good engineering, or good communications unless all three are good? These three important branches of the service are interdependent. Guns are of small value unless the engines can place them where they can best be used. Engines are valueless for fighting a successful engagement unless the captain knows where to order his engines to take his guns.

Can our captains now *depend* upon knowing where the enemy will be? Can our excellent guns render a maximum value? What captain will put his best turret officer in charge of communications? How many will put their worst? How many will spare any turret

officer for communications? Yet, one turret officer controls one turret. One communication officer may bring success or failure to all turrets.

Considering the comparative infancy of communications they are good. But we can make them better. Recognition of their importance by the service in general will make them so.

As the human brain is to the body, so is the communication service to the navy. How does one write? The body assumes the proper position. The coordination of brain, hand and eye then causes the written word to appear. If a hand or an eye be gone the body still can succeed. If the brain be gone, all is gone. The communication service is the brain of the ship. The guns are the hands, the engines the feet.

It is doctrine that we must have information. The service admits that communications are vital in war. There is much talk about the lack of scout and battle cruiser types. The fleets must have eyes. But the scouts must also be able to report what they see.

Recently a ship's radio officer was questioned regarding the reason for having an ensign detailed as communication officer on the ship to which he was attached. His answer was that the ship had only five lieutenants and that the others (the officer being questioned was himself a lieutenant (T) (G)) were all assigned to the engine room or the battery. How many young ensigns were senior turret officers, do you suppose? Which duty should be the most important? Aside from the fact that the ensign can ill spare protracted relief from watch standing experience the service also suffers. One turret is not of more importance than the ship. Incidentally, the Department recognizes this in that it is not permissible to detail an ensign as communication officer of the ship. Gunnery needs more experienced personnel numerically, but one officer of reasonable experience should be assigned to communications on each battleship.

It is not uncommon for some of the battleships to have ensigns for communication officers; and for others to have a more experienced officer assigned to communications in addition to other duties—a turret perhaps.

It is undesirable that the communication officer should be picked after the other departments have had their choice of the available material. It is hoped that the day will come when communications

will be recognized and will be established into an independent department, with a regular departmental head on each ship. If it is as important as its sister branches it should have equal rank with them in the assignment of officers.

The communication officer need not have had previous experience as such. This is, of course, desirable but not necessary. His major function is administrative. He must keep the wheels moving. It is his function to see that his subordinates—his technical assistants—deliver the results. He is, of course, in charge of all forms of communications with the necessary technical assistants in each branch.

Of these assistants the most difficult to train is the radio officer. The signal officer need not be the best signalman on the ship but he must be able to take executive charge of signalling on the bridge at any and all times. This can be learned with a reasonable application. The radio officer cannot be so easily obtained; it must be decided just what will be the limit of his technical knowledge. What, at least, will be the required lower limit. Radio is too much of a science for an officer to master it as a side issue of his line duties. Failing strict specialization the lack of a complete technical knowledge of radio among line officers must be admitted. Radio engineering is a complicated study and cannot be less easily learned than any other science. No officer of the line can afford to give sufficient time to master it. It is a question of years. Such few officers of the line as are taken into the engineering corps with a radio specialty will have to be depended upon, together with the civilian radio engineers, for the design work and for getting out the instructions about the care and use of the material provided. An occasional radio gunner will develop ability along similar lines but this will be the exception rather than the rule.

The gunners can be depended upon for the necessary knowledge to carry out the instructions for the care and operation of the set and for effecting repairs.

The average radio officer—under present conditions of little specialization—cannot be expected to be a material expert. He can be expected to be thoroughly competent to act as a directive head for the gunner and his men. He must be skilled in traffic handling; must make a study of the field in which radio can be used; must perfect the details of the ship's radio organization, must conduct a school for operators as well as for the strikers, covering the

elements of electricity as well as buzzer instruction; must demand that the gunner and his men get results. He must have a good general knowledge of radio but not necessarily a complete detailed knowledge. The greater his knowledge of radio material the better—providing that he is a line officer—but this is not vital for we cannot expect him to have it. It is better to look the situation in the face than to try to hold him for something which he has no means of knowing.

The new communication regulations when finally issued will no doubt state in detail the duties of a radio officer. This is important. The midshipmen at the Naval Academy are now using a pamphlet covering these duties. This would be a help to the service at large were it made a part of all ships' libraries. It is hard for a young ensign to be called up and told "you are radio officer, go to it." He usually spends much of his time playing with a buzzer because he does not know what else to do to qualify himself for these strange duties. Unless there is a former radio officer on the ship he does not know where to turn to find out what he is supposed to do. This lack of knowledge of his duties is not confined to the radio officer. Many of the older officers do not know what to expect of him for, due to the comparative infancy of radio, many of them do not know what a radio officer is supposed to do other than to get the message through. Of course this is the ultimate mission of radio but there are many preliminary steps in the organization of an efficient force for getting the message through 100 per cent of the time. The opinion is not infrequent that the radio officer is available for odd jobs because "he doesn't do anything anyhow." So few of the older officers have been radio officers themselves that many have a perfectly plausible lack of knowledge of the dimensions of a radio officer's duties. Not what he must do but what he should do. The outstanding radio ship is almost always one which has a captain who is "behind" his radio officer.

It is to be hoped that the new communication regulations will cover in detail the duties of each of the various officers in the communication department in addition to the radio officer. In this way an officer can break in in a much shorter time than at present obtains. The navy regulations cover the duties of the navigator and the doctor and the supply officer, etc., but are neglectful of the communication branch. This can be easily rectified in the communication regulations. (Unofficial correspondence with the De-

partment subsequent to the writing of this article has brought out the fact that the Department intends to cover the general duties, but that it is impracticable to cover the duties in detail, in view of possible omissions. This general outline will doubtless be entirely satisfactory from the point of view of the communication personnel afloat.)

The radio gunner should be an expert radio repair man and will, of course, be an operator. The radio officer should be detailed for the duty for not less than one year, and if he is informed in advance that he is to be assigned to the duty he can easily learn to operate before he takes over the job. With these two officer operators on each capital ship it will be a simple matter to arrange officer discrepancy watches. That is the major reason why officers should be operators. It should be a rare case when a gunner is ordered as radio officer of a ship. They, through no fault of their own, have been denied the training given a line officer and hence cannot be expected to be as well qualified for administrative work as a trained line officer. Then, too, they are specialists. It is unfortunate but true that specialization in any branch sometimes tends toward a narrowness of vision. The trained executive, not a specialist, is much more likely to see the ship as a whole and determine the particular mission which radio and communications must fulfill in relation to the other branches.

For a staff afloat it is believed that a slight modification should be effected in the existing organization. For a fleet staff it is believed better for the communication officer to have no other duties. This would not be necessary for the subordinate staffs of the fleet inasmuch as the fleet staff is responsible for the greater part of the organization work. When the fleet is together, as is usually the case, the subordinate staffs are more in the nature of executives for the fleet staff, in carrying out policies, schedules, and drills. Under the present organization it has been the custom to consider all forms of communication as communications, this includes mail. The flag secretary is ex officio staff communication officer. This plan was worked out by one of the ablest communication men the Atlantic fleet has ever had; but it is doubtful if that same officer were now in his old position whether or not he, too, would not agree that the enormous increase in traffic since his incumbency would not warrant a separation of dispatches from mail. There is no question that a letter is a "communication."

Yet it lacks the one factor which tends so much to make or break the efficiency of dispatch communications—speed. For efficient communications, speed is vital. The flag secretary is usually the one officer on the staff most confined by detail work. He has less spare time than any of the other officers, excepting, of course, the chief of staff. In addition to the mass of confining correspondence which must be handled he is given the additional duty of being called communication officer. As a result it is quite common for the radio officer to do much of the planning for general communications. Or if the radio officer does not usurp this function of the communication officer it is sometimes not done at all. A flag secretary has no time for planning or organizing beyond his own job, or, if he has, or if he takes the time it is unfair to him. The present division of work of the staff is a little out of balance. The radio officer should not be communication officer. He will quite naturally favor his own branch to the possible detriment of the others.

The best solution of the problem would call for a fleet communication officer with no duty, except in that branch. Some staff assignments are now allowed for duties much less important than communications. The fleet communication officer should be an experienced communication man. He can be drawn from the subordinate staffs after a period of instruction there or he can be drawn from the shore communication service. He should have sufficient rank to be senior to the force, division and ship radio officers, flag lieutenants and communication officers. An admiral has no time to go into the intricacies of radio. He is apt to judge the efficiency of his communication personnel solely by results. As a result much of the technical work is done directly between the unit technicians. For this reason it is important that the various technicians scale down the line of seniority according to the seniority of their admirals. It is not the best organization for a force radio officer, or communication officer, or flag lieutenant to be senior to his opposite number on the fleet staff. So fine a distinction might be impracticable but this scaling should obtain for communication officers at least. The fleet staff make many of their decisions after conference with the subordinate unit staffs. It is an awkward situation and does not make for efficiency. The junior man carries the responsibility for the decision and this may mean that he will decide against the advice of the more experienced officer. Result?



The senior officer will offer no more advice from his greater fund of experience and his services will be partially wasted. This situation is no more pleasant for the junior than for the senior. He dislikes going against the advice of the senior yet he is carrying the responsibility and must use his own judgment.

Due to the increase in size of the fleets there has gradually come to be a need for a fleet tactical officer. The old flag lieutenant was usually only moderately senior. His duties as an aid are not of a type to make senior officers want the combined jobs. The duty has slowly divided itself until now it is quite customary for the fleet tactics to be handled by one officer while the aid's duties are handled by a much younger officer. The fleet communication officer should be an officer of experience and he could if specially selected well handle the duties of fleet tactical officer as well. The flag lieutenant could handle the duties of aid and fleet signal officer, without difficulty and his moderate rank would fit him for this. Subordinate flag lieutenants should be junior to the fleet communication officer and if so not necessarily junior to the fleet flag lieutenant. The greater number of difficulties which must be adjusted will be questions of interpretation of the standing orders or of the signal book and these can be straightened out by the communication officers of the units.

It is believed that the flag secretary should be subordinated to the fleet communication officer for sending and receiving mail as this is one form of communications just as it always has been.

The question of the authority of staff communication personnel on a flagship should be definitely decided. The preliminary issues of a portion of the new regulations say that the staff radio officer shall have charge of the radio installation on the flagship. If this means that there shall be no ship's radio officer, it is not believed that this is a good organization. There should be a complete ship's organization upon which the staff organization can be superimposed. It is not infrequent for a staff to change flagships. If they have had entire charge of the bridge and the radio what sort of an organization will remain after the transfer? Will this ship be as efficient for war as her sister ships that have not had the staff removed? There is another side to this same question. The staff are, through their admiral, responsible for the bridge and radio of all the ships of the unit. It is only human nature to want the flagship to be better than the others if they are personally responsible for the

efficiency of the flagship. This will warp the point of view of the staff and will increase dissension with the consequent reduction in efficiency of the remainder of the unit. The staff technician can have the necessary authority without having direct charge of the installation. It is immaterial whether the radio officer of a flagship tells a supervisor verbally that he can or cannot clear a message or whether he does this by radio or bridge. If the radio officer sends a "Q" to some ship other than the flag is not this similar to telling the operator on the flagship verbally to "wait"? The staff personnel is of course under the discipline of the captain but they are not under his command for work. The arrangement whereby the staff assumes direct charge of the radio or bridge is unfair to the captain, the ship, the remainder of the unit, and the service. This requirement is mentioned in the Naval Regulations 786 (7). The Communication Regulations, at present, do not cover it. The commander-in-chief, Atlantic fleet, in an order once issued stated as follows:

*Flagships.* On board flagships the ship's communication officer is to coordinate with and be subordinate to the flag officer's organization in regard to despatch work. He must insure, however, that the ship's communication organization remains intact and capable of carrying on, in the event of transfer of the flag. The flag officer's organization should be considered as superposed upon that of the ship.

Another thing which would be of immense help to the inexperienced personnel breaking into the Communication Department, especially radio, would be a bureau pamphlet descriptive of the standard radio installation, with complete instructions for the care and operation of the set. At present new personnel is in a quandary unless there is an experienced chief or gunner available for explaining the installation. Now that the battleship installation is standard it should be practicable to get out a pamphlet of this nature. It would be valuable to the service. I have seen radio personnel, in an attempt to "make the set work" proceed on the trial and error basis. This was done because, apparently, they lacked complete knowledge of the installation and the various reasons why it is connected as it is. Blue prints are never as satisfactory as a manual containing more or less description, especially for use by inexperienced personnel.

Coding drill should be encouraged in the fleet. Not that coding or decoding should be a daily occurrence but at least one drill each

week should be continued. Nothing will bring efficiency in the use of the code books except familiarity and only experience and practice will bring familiarity. This is especially applicable to our present signal books. Familiarity with the contents and the manner in which they are made up will do much to increase the speed of the officers using them. Familiarity with the method of making up the books is as essential for officers writing messages as for those actually coding and decoding.

Only officers of recognized standing should have access to the code books in peace time.

It would be better if the radio schools ashore could turn out all of the operators. It is doubtful if a system whereby certain recruits are allowed to go to the school is the best. The requirements for maintaining a sufficient number of radio strikers—certainly one for each vacancy in complement of radiomen—should be rigidly adhered to. The strikers should be hand picked for their previous schooling. No man should be allowed to join the radio force who is not educationally potential material for an operator. There are some strikers who have insufficient knowledge to ever become more than third-class operators—if that. This is unfair to the service and is unfair to the man. He might be making good in some branch where schooling is not a requirement and the service might in his place be training a potential chief radioman or gunner. If the strikers were carefully selected—and few branches demand as much elementary education as radio—then the apt ones sent to school ashore there would be no occasion for the usually unsatisfactory radio school on the ship. Something is likely to interfere. There is bag inspection or early liberty, or watches or general drills. All in all the radio schools on board ship are not efficient. The inapt strikers should be dropped from the radio force as soon as they have been shown to be such. No use carrying them as “dead heads.” The service, especially the operators, pays too much attention to operating ability. Traffic can be handled very efficiently at not over 25 words a minute. Yet every operator has an ambition to reach 30 words. The last 5 words come slowly. It means hours of practice over a considerable period of time. They could be better spending the time studying the elements of radio. A first-class radioman once confessed to me that he knew “nothing about the set.” He could operate and there he stopped. That is not efficiency. There are many smaller ships having no chiefs. A first-

class man should be able to care for a set and make routine repairs. The 30 words are desirable but not at the expense of elementary practical work. In the absence of the system of schooling mentioned above it is necessary that the school be continued on the ship. School in the afternoon is subject to continual interference. School should be held in the morning, or even better require a certain number of hours per day (2 to 3 hours in part) and let the ships vary their time of holding school as necessary to get in the required number of hours. It is allowable now to send strikers to the Great Lakes for Schooling. This should be carried out. The two-year enlistment has played havoc with this scheme. The Great Lakes School (or the Bureau of Navigation) would help by getting out an outline of work for ships schools and sending it out to the service as an outline of work to be followed in schools in the Navy Yards during overhaul. This school could be in the nature of post graduate work for the Great Lakes graduates. All men should be graduates of the Great Lakes schools if practicable. The navy yard school could carry one section for strikers qualifying for the Great Lakes course. Officers should conduct the school. If there is a practical section run by a Gunner or a chief—and there should be—still a radio officer should be there in charge of the instruction.

In radio drills instruction ought not be subordinated to competition. Procedure drills are not for the purpose of training strikers to read radio messages. But they should be for the purpose of increasing the knowledge of the already qualified operators and strikers. No man will be placed on watch of course until he is competent to send and receive. But this does not necessarily mean that he is a thoroughly qualified traffic man. It should be so, but that is impracticable under the present method of obtaining operators. Our mission to be furthered by the drills is to take an operator already qualified to send and receive and by the drill to make him a thoroughly qualified traffic man. This will not be done under a system where competition is the major feature. Radio from its nature is, for drill purposes, a one or two man proposition. *One* good radio operator can stand the ship first in competition thus gaining for the ship a reputation and a credit to which it may not be entitled by the actual average radio excellence of the ship. And no one man can receive all the messages for war. We are training for war not for drill. There should be a scheme whereby the man actually on watch receives the drill messages and no expert may

listen in with the operators to catch the missed parts. Strikers should listen in for experience. The man actually receiving the message should be a better operator than any of the other listening in on his set, except of course the officers. A recapitulation should be made at the end of the month and ships should be rated according to the number of errors and the number of operators taking the drill. For example, a ship having 15 operators should not be rated first unless each of these men had received at least one drill. A simple way to work it out would be to figure the standing as is customary based simply on errors and then reduce this standing by applying a penalty for each operator who had not taken at least one message. The ship which shows the best average number of messages per operator should get a bonus. In this way you can get away from the ship which puts her leading men on for drill regardless of the efficiency of the remainder of her radio force. The average operator is lacking in knowledge of the new procedure and he will gain this knowledge only through drill of the right kind, or through long experience on watch.

When the fleet is at sea radio drills in conjunction with flag hoist as provided in radio instructions should be held. It is customary for the flags to be hoisted well ahead of the radio. As a result it is not long before the radio gang begins to lose interest. True, in battle the flags will be up first *if they can be seen* but there may be times when dependence will have to be placed on the radio. For that reason it would be a good plan, sometimes, to send the radio messages in advance and answer them with flags before executing. This is done—but infrequently. In this way the morale of the radio operators will be kept up.

Ships not now so fitted but having loud blowers should have a hood or a small head booth built over the voice tube outlet (from flag plot) in main radio. At present the noise of the blowers makes communication from flag plot difficult. The only I. C. telephone jack in main radio on some ships is a JX. There is no JX in flag plot. There is a JX in auxiliary radio. Either a JX should be put in flag plot (a take off from the one on the bridge) or some separate circuit should be put in. If JX is to be used for communications the other departments ought to get off of it. If a division were to maneuver by radio the Admiral commanding could save a great deal of time by being in telephonic communication with the sending operator. There is a buzzer system installed from flag plot to the

various radio rooms. Their use is feasible but is slow compared to an efficient telephone system. The buzzers would do well for a secondary. Buzzers on loud speakers sound all over the bridge and the radio officer or an operator reads them wherever he may be on the bridge. An objection to this is that the additional noise is unnecessary for efficiency. Few captains and fewer admirals like noise on the bridge. With a telephone for primary and with the voice tube and the buzzer for secondary, communication should last as long as the rest of the ship does. The pneumatic tubes are necessary for confirmations and for handling long messages. It is of course preferable to send all messages through the tube in writing if time permits.

Talkers should be especially selected on all ships and trained in procedure so that when a conventional signal comes over the tube they will know its meaning. Communication yeomen or radio personnel should be used for this purpose.

In port it is thought desirable to keep additional watches on depending on the number of operators available. The only watch usually ordered is on Auxiliary on ships so equipped. This gives an operator too few watches to keep him in training. With a possible reduction in fuel allowances for 1921-22 this lack will be enhanced.

The radio gang should not get watch-standers liberty (1.00 p. m.) unless they are standing not more than a watch in five. The plan of keeping one watch on and letting the rest go ashore as watch standers is faulty. There is plenty for them to learn about radio. They are lacking, as a force, in the knowledge of radio material. They can operate, usually, but are frequently deficient in material knowledge.

In my experience the average radio force needs discipline. Being exempt from ordinary work on deck and from discipline teaching drills they on some ships are allowed to slack down. If this condition obtains it would be well to require some form of infantry for them daily. Operators should not smoke on watch; ventilation of the lower deck radio rooms is none too good normally.

When the fleet returned from Panama the Pacific fleet radio officer got out a suggestion concerning the method of using radio in harbor in order that the men would not go stale. He in accordance with the gist of his suggestion wrote to the Pacific coast communication superintendent and obtained permission to use the radio

sets in harbor under certain restrictions. For cause it has never been placed in effect. Some such plan should be adopted if the men are to actually learn radio. One scheme, is to have the regular guard ship act as radio guard ship for *auxiliary* radio, and for main spark. The first relief guard ship acts as arc sending ship and the second relief as arc receiving ship. This would have to be worked out according to the shore station schedules for the locality in which the fleet is based. If a part of the ships are out at sea in the vicinity of the harbor the guard schedules remain unchanged. A few miles makes no difference in their ability to handle the traffic. If they are out of range the guard ships fleet up according to their regular sequence on the list (Fleet Regs.) upon order from S. O. P. This system is automatic and is easy to remember.

It would be better that neither the fleet radio officer nor the force radio officer should have to worry about anything but his own organization and plans. A staff radio officer can be a very busy man if he has a chance. He should have no additional duties.

The fleet radio officer should make up a definite set of requirements for rating of operators. It might be necessary to have these approved by the Bureau of Navigation. A fleet examining board should examine all candidates unless ships are on detached duty, for protracted periods. Under the present system the examining board may know less radio than the candidate. As a result incompetent men are, sometimes, rated to the detriment of communications. Some *first-class* men cannot do anything in radio except operate. This is manifestly wrong.

Some check up system on the speed of handling traffic (as used on the *Wyoming*) should be required. The times between ships are good—perhaps satisfactory—but the time lost within the ships is often excessive. The slowness of communications is not so much in actual transmission as in the internal routing and red tape on the ship. Too much red tape and not enough speed.

The interest among the older officers in communications is on the increase. If they, at the helm of the service, will believe in the necessity for an added efficiency in communications it will come. And with it will come better gunnery, better navigation; in short, a better navy.





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OUR RICH BUT NEGLECTED OLD NAVAL  
HISTORICAL LITERATURE

By LOUIS N. FEIPEL

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A comprehensive history of the United States Navy still remains to be written. The so-called "histories" of the navy are for the most part confined to accounts of the various wars in which we have engaged at sea, while the activities of the navy during the long intervals separating those wars—although equally interesting and important in their own way—have been recorded therein only cursorily and fragmentarily. Fortunately, however, the printed material available for a study of these peace intervals is quite adequate for the purpose, and the only drawback to its perusal and manipulation would seem to be the non-existence of a complete collection in any one place, together with the want of a systematic guide thereto.

In the belief, therefore, that this great mass of naval historical literature should be marshalled in logical order and properly codified, the present writer has busied himself for several years past in getting on the track of every publication bearing upon the subject, and examining it to determine its value as a naval historical source. Thus far, his efforts have been directed mainly to the period extending from the close of the war with Algiers, in 1815, to the beginning of the Civil War; and the accumulation of bibliographical information which has resulted has amply repaid the compiler's efforts.

The period in question is commonly referred to as the era of the old navy, in contradistinction to the period of the new navy which came some time after the Civil War. But considered from the point of view of efficiency and service, it deserves to be styled the golden age of the United States Navy. For those were the years when our naval architecture was second to none, when our maritime

enterprise astonished the rest of the world, when our warships circumnavigated the globe and made cruises of from three to five years' duration, when our naval officers performed various difficult diplomatic services, opened up and extended American commerce in the Orient, suppressed piracy on the high seas and otherwise punished depredations on our commerce, assisted in suppressing the African slave trade, conducted numerous surveying and exploring expeditions in various regions of the globe, made many notable contributions to scientific knowledge, relieved suffering humanity on various occasions, and was always prepared to protect American interests and assert American rights wherever necessary. In consequence of all this, American literature was vastly enriched by the publication of sundry accounts of the events occurring in connection with these services—a literature rich in its scope and variety, and numbering upwards of 300 separate items.

Unfortunately, however, no critical account of this naval literature has as yet been published. Neither is there gathered together in one place anything like a complete collection of the source-material in question. The collections of the United States Naval Academy Library, the Navy Department Library, the Library of Congress, the New York Public Library, the Barnes Memorial Library (New York), and the private library of Mr. Charles T. Harbeck (New York), probably approach somewhat near to completeness, but not one of them can produce all of the items included in the present writer's manuscript bibliography. Several items, in fact, are not contained in any of the above collections; and others, again, are so rare as to be found in only one or two places.

As was said above, the number of items in a complete collection of the naval literature covering the period under consideration would be between 300 and 400. Of these, more than 100 bear upon the famous Wilkes Exploring Expedition alone. No other single episode throughout the entire peace existence of the navy can make anything like such a literary showing. The naval operations during the Mexican War, the suppression of the African slave trade, and the Japan Expedition, were likewise prolific in literature, but the great majority of naval events of this period produced anywhere from 1 to 10 items.

In form, these various literary productions range from printed official reports, proceedings of naval courts martial and courts of inquiry, and miscellaneous Congressional documents, to books of

travel, works depicting American man-of-war life, biographies of all sorts, volumes of naval reminiscence, scientific works, lithographic works, and magazine articles. The Congressional documents alone number about 125; court martial and court of inquiry proceedings, 7; books of travel, 67; works depicting man-of-war life, 23; biographies and volumes of naval reminiscence, 51; scientific works, 50; lithographic works, 11; and magazine articles, 62. Truly a wealth and variety of printed material in which to delve for historical facts.

As regards the naval historical contents of these various publications, investigation reveals the following: Of items bearing upon the diplomatic services rendered by the navy during this period, there are about 30, one-third of which are not touched upon in the excellent survey of the subject published by Mr. C. O. Paullin under the title, "Diplomatic Negotiations of American Naval Officers" (1912). The Japan Expedition in 1852-4 is, of course, the shining episode in this group, with 10 items to its credit. The remaining items refer to less-known, but nevertheless important, events, such as the mission to the Spanish Provinces of South America in 1817-8, the protection of American interests during the blockade of Montevideo in 1826-8, the negotiation of a treaty with Turkey from 1826 to 1830, the embassy to Cochin-China, Siam, and Muscat in 1830 and 1836, the liberation of imprisoned American seamen in Japan in 1850, the prevention of the attempted invasion of Cuba from the United States in 1849-50, the arrest of William Walker, the filibuster, in 1857, and other minor episodes.

The opening of the Orient to American commerce was materially assisted by the voyage of the merchant ship *Franklin* to Cochin-China, in 1819-20, under the command of an officer of the United States Navy, of which an account was subsequently published. And this same commerce was afterwards furthered and extended by the persistent watchfulness of the East India squadron, culminating finally in the opening of Japan by Commodore M. C. Perry. Moreover, on various occasions—as the literature of the subject fully evidences—our trade with China was seriously jeopardized, but always strictly upheld by the activities of our squadron in those waters.

The suppression of piracy in the West Indies by Commodore Porter, in 1823-5, is well known. But other similar services were performed by the navy, which, although now almost completely

forgotten, were written up at the time and published. Thus we find accounts of the punishment of the Quallah-Battooans of Sumatra, in 1833, by Commodore Downes; the punishment, in 1839, of the acts of piracy and murder committed by the inhabitants of Muckie, also in Sumatra; the protection of American fisheries on the coast of Newfoundland in 1853; and the punishment of the Fiji Islanders by Commander Boutwell in 1855.

The American share in the suppression of the African slave trade from 1843 to 1860, as is well known, fell to the lot of the navy, and a number of records of the services performed on this arduous duty have come down to us. Mutiny also figured in the annals of our naval history in those days. Besides the memorable alleged mutiny on board the *Somers* in 1842, of which at least seven published records are extant, we have two accounts of the pursuit of the mutineers of the whaleship *Globe* among the Mulgrave Islands by the United States Schooner *Dolphin*, in 1825-6.

Of a more peaceful nature were the various surveying and exploring expeditions conducted by officers of the navy from 1838 to 1860. The first and foremost of these was the Wilkes, or South Sea, Surveying and Exploring Expedition, which was so prolific of both scientific and literary results. As mentioned before, this single episode merits a bibliography all for itself, on account of the number of books, pamphlets, and periodical articles which have been published about it. Other naval exploring and surveying expeditions of the time which have been written up are the expedition to explore the River Jordan and the Dead Sea, in 1847-8; the two Grinnell Arctic expeditions, in 1850-1 and 1853-5; the exploration of the valley of the Amazon, in 1851-2; the survey of the Isthmus of Darien, in 1853-4; the La Plata exploring and surveying expedition, in 1853-6; the North Pacific Surveying and Exploring Expedition, in 1853-6; the Atlantic Cable Deep Sea Survey, in 1857-8; the surveying cruise of the *Fenimore Cooper* in the Pacific, in 1858-9; and, finally, the Chiriqui Surveying Expedition of 1860.

But these missions of peace, in which the navy was so meritoriously engaged in this golden age, were interrupted for a time by the war with Mexico, in which the navy played a signal part, as is witnessed by the published records relating thereto, about 17 in number. Later on, too, in this same period, we have records of such war-like operations of the navy as the bombardment of Greytown,

Nicaragua, in 1853-4, the suppression of the Indian uprising in Washington Territory in 1855-6, and the unsuccessful expedition against Paraguay in 1858-60.

In the cause of humanity, also, the navy won for itself lasting laurels during this period. Writers have recorded the voyage of the *Jamestown*, in 1847, to relieve famine-stricken Ireland, the expeditions in search of Sir John Franklin and his companions (mentioned above), and the Kane Relief Expedition in 1855. On the other hand, contemporary historians have had to record several American naval disasters, as the conflagration on the *Missouri* off Gibraltar in 1843, the wreck of the *Boston* in the Bahama Islands in 1846, the loss of the *Somers* during the Mexican War, and the loss of the *Albany* during her cruise in 1852-4.

This was also, *par excellence*, the period of extraordinary cruises for naval vessels. Circumnavigations of the globe appear to have been the order of the day. No fewer than 20 such circumnavigations of naval vessels have been recorded in ample detail. The distances covered in some of these cruises frequently totaled 60,000 to 70,000 miles. In one case the maximum distance of 100,000 miles was reached, but strange to say no complete account of this famous cruise appears ever to have been published. In making these cruises, also, the vessels were frequently away from home continuously for from three to five years. Naturally, the contemporary accounts of these voyages are replete with information regarding the mode of life pursued on board; and yet this field of research has been practically left untilled. Our officers and men of the old navy were at pains to record what to them must very often have been the commonplaces of existence, but which to us would prove to be as interesting as a journey of observation through a strange land. And there are, in truth, some veritable gems among these old records. Moreover, the one that is no doubt most familiar to present-day readers—Melville's "White Jacket"—loses much of its originality in the light of what was published just prior to it by the less-known pioneers in that kind of writing. Altogether, there are nearly 25 such records which throw light upon the man-of-war life of that interesting period.

Another fruitful source of naval historical data is provided by the numerous biographies of officers and men who flourished during those years. There are biographies, autobiographies, memoirs, volumes of reminiscence, and letters, written by all ranks of officers

from commodore down to midshipman, and several of them written even by men before the mast. A number of the subjects of these biographical volumes saw service in the navy throughout the entire period of this golden age, notably Commodores M. C. Perry, Hiram Paulding, A. H. Foote, D. G. Farragut, and Josiah Tattnall.

But the most popular form of publication resulting from the operations of the old navy appears to have been the narrative of travel. It cannot be denied that the cruises of our naval vessels afforded excellent opportunities for seeing certain wonders of the world, and the literature of travel has been correspondingly enriched thereby. Thus the Mediterranean squadron visited the ports of Europe, northern Africa, and the Levant; the Brazil squadron, the east coast of South America; the Pacific squadron, the west coast of South and North America and the islands of the Pacific Ocean; the East India squadron, the various ports of Asia; the West India squadron, the islands of the West Indies and the ports on the Gulf of Mexico; the African squadron, the west coast of Africa; while occasionally other special ships visited every known quarter of the globe washed by the seven seas.

In the exercise of their profession, also, certain naval officers of the time became highly proficient in scientific pursuits. We have, for instance, the contributions made to hydrography and meteorology by Lieutenants Charles Wilkes, M. F. Maury, S. S. Lee, O. H. Berryman, and the various other naval officers connected with the survey of the coast of the United States; then the astronomical researches of Lieut. J. M. Gilliss, Lieut. C. H. Davis, and Chaplain George Jones; the investigations of the officers attached to the Light-House Board; the contributions to ethnology and physical geography made by Lieutenants I. C. Strain, W. L. Herdon, Lardner Gibbon, W. F. Lynch, and T. J. Page; the Arctic explorations of Surgeon E. K. Kane and Lieut. E. J. DeHaven; the improvements in ordnance and gunnery made by Commander D. G. Farragut and Lieut. J. A. Dahlgren; the development of the art of navigation by Lieut. M. F. Maury; and the botanical and medical works of Surgeon W. P. C. Barton. While to the South Sea Surveying and Exploring Expedition a number of civilian scientists, notably James D. Dana, Charles Pickering, Asa Gray, S. F. Baird, and A. A. Gould, owed the first thorough grounding in their respective fields of research. Furthermore, the draughtsmen attached to that expedition, as also to the Japan Expedition,

left monuments of their artistic achievement in the form of volumes of colored plates which stand to-day as marvels of early American lithographic art.

Mention must also be made of the naval authorship of a great portion of this literature. Of works written by naval officers, covering this period, we count upwards of 70, the authors being represented by all ranks and grades of the service—officers of the line, medical officers, pay officers, chaplains, schoolmasters, and professors of mathematics. But what is much more interesting, and at the same time highly creditable to our country, is the fact that 18 works are from the pens of enlisted men (bluejackets and marines), the earliest of these having appeared about the year 1834. Then, too, among the various authors of all sorts represented in this survey, are to be found a number of writers of note, the most notable being Nathaniel Parker Willis, James Fenimore Cooper, Nathaniel Hawthorne, Herman Melville, Bayard Taylor, Walter Colton, W. S. W. Ruschenberger, Charles Nordhoff, Henry Augustus Wise, and Alexander Slidell Mackenzie.

Some of the works under consideration were furthermore regarded as of sufficient importance to be published in foreign editions. We find British editions of 15 of them, a French translation of one, and a Dutch translation of another. Moreover, many of the works passed through several editions, the number in one case amounting to eight. On the other hand, several works are now extremely rare; so much so, indeed, that in the case of four items the writer has been unable thus far to locate even a single copy.

Enough has doubtless now been said to demonstrate that this rich but neglected field of American literature is worthy of being tilled to the utmost. Mr. C. O. Paullin gave hope for a time that he would make this task peculiarly his province, but other labors have apparently diverted him from the purpose. Mr. R. W. Neeser has also advanced a short distance into the field, as had likewise the late Mr. E. S. Maclay. But until the work is taken up in earnest by a number of students, the treasures will continue to remain stored away in many scattered and out-of-the-way places. Let us hope, however, that the day will come when they will be raised from obscurity into the glorious light of America's naval prestige.

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## PRACTICAL HINTS ON HANDLING A DESTROYER

By LIEUTENANT R. O. GLOVER, U. S. Navy

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The large building program that our government inaugurated in 1918 to combat the submarine menace in the World War has given the navy 300 destroyers of the flush deck type. These vessels are more nearly homogeneous in hull design than any other types that make up our fleets. In addition, they are all turbine driven, with two out-turning screws. The main engines are either Parsons or Curtis design, or some slightly modified design that permits the altered type to be included under one of the two main heads. These facts are of particular interest to the destroyer commander, for it permits him more easily to learn the maneuvering qualities of the vessels as a class. At the same time, it simplifies the presentation of these "hints," and, unless it is specifically pointed out to the contrary, the information given in this article refers to any destroyer of the flush deck type.

This large destroyer force demands for its efficient maneuvering a very much larger percentage of regular officers than the smaller force of destroyers of pre-war days needed from the navy as a whole. But the expansion of our navy has placed the experienced officers of our pre-war force high up in the grades of naval rank, leaving the present force with but few of these able destroyer commanders to teach the present personnel.

It requires no effort to admire the ease and simplicity with which the destroyer handles when controlled by the experienced commander. The type has a grip on your imagination that thrills. You would like to feel the vessel under your feet yourself, and be master of this vessel with its graceful lines of a gray-hound and the hidden power of a battleship.

The field is open, destroyers are waiting for commanders. The lieutenant is in line for captain, and orders are issued daily sending

him to this duty. It is this thought that has prompted me to put on paper these "hints." The naval officer is required to spend hours over books, ordnance, law, engineering, etc., but ship handling is evidently a heaven-sent gift, or assumed to be so. Such training as he may get is learned in the hard school of experience. The lieutenant is expected to take a destroyer out without possibly ever having been aboard one before. He learns his lesson under the lash of "get away with it." It is, therefore, the mission of this article to help bridge the gap, giving to the inexperienced destroyer captain the ideas, observations, and personal experience of one who has been through the initial test.

The first trick that you may be called upon to do in handling a destroyer may not come to you until you have been on board for some time. If this is the case you are lucky, for this period can be used in watching your captain make landings, get underway, or turn in a crowded harbor. Your attention at these times should be on the effect produced by the orders that are given to the engines. What happens with one engine backing, the other two-thirds ahead, and the rudder hard over? How far does she carry her headway after the engines are stopped from one-third ahead on both? These and similar thoughts should be constantly in your mind. At the same time, the effects of the wind and tide must be noted. The learning of these points is what is meant by "learning your ship," and it is your chief study. At the same time remember that a ship is as changeable as a woman and that you cannot take anything for granted. For this reason, keep a few tricks up your sleeve to pull in case the old girl riles up a bit.

I was one of the lucky ones in my first job, having had some three months of destroyer service. One day the orders to move came unexpectedly, and the captain was not aboard (orders have this habit in the boats). So it was up to me to get the ship underway, and go to the oil dock for oil. At the time, we were tied up port side to another destroyer, and the dock was down the bay a few hundred yards. It was a case of perfect weather and tidal conditions, so I decided to back away. But it is not my intention to tell you how I got underway and then made a landing alongside the oil dock. I will leave the methods of making landings and getting underway for treatment later. However, I believe at this moment, you will be interested to know if I was nervous. I admit that I was. But I also remember that my nervousness wore off and after

the maneuver was well underway was entirely gone. I believe that this is the experience of all officers. You can, therefore, expect to be a little nervous when you first step on the bridge, but don't let your nerves get the upper hand.

In regard to the maneuver, everything went as I had planned, and I put the ship alongside the oil dock without a hitch. The effects of the maneuver on my own morale were marked. It gave me self-confidence. However, I have made plenty of poor landings since then—and found that a landing is just something in the day's work of a destroyer skipper. So if you bungle—don't worry.

Before going on with the manner of making a landing, getting underway, etc., there are some most important speed adjustments of the main engines that should be made for good maneuvering. These are best made at sea, with plenty of room, and after they are once made you are fixed for your cruise.

The maneuvering speed for both engines standard ahead is 15 knots. A few "old timers" have used 20 but the consensus of good practice does not back them up. In fact, at 20 knots things happen too fast for most of us. One novice tried 20 knots as standard speed for maneuvering in leaving the New York Navy Yard for the first time, and for the first time he had handled a destroyer. The results were disastrous, as might be expected, and he took his ship out of the yard after ramming two lighters, and giving a battleship tied up in there enough thrills to last a year. Talking to his executive, who was an old destroyer officer, he laid the blame on the speed, since the situation was out of control before it could be sized up properly.

Having decided on 15 knots for maneuvering speed, and with your ship at sea, or with plenty of room, adjust the turns of the engines so that with one engine backing one-third and the other making ahead one-third the resultant force will give the destroyer a little headway. Similarly, make the adjustments for two-thirds, and for standard ahead and back full. This arrangement will keep headway on the ship, when using equal power for turning with both engines. Full ahead is 20 knots, and back emergency full at least 20 plus whatever else they have below.

Let us now consider the most elementary point in maneuvering, namely turning a destroyer with the engines. The turning circle of a destroyer making 15 knots through the water is 850 yards,

but by using the engines, you can cut this circle, with ordinary conditions of wind, down to 350 yards. The points to be remembered in this maneuver are, first, to keep headway on as long as possible, and, second, when forced to back, to go astern for as long a reach as possible before coming ahead again. The problem of turning was of almost daily occurrence in entering San Diego harbor (the tide is never right, you can nearly always bet). The harbor there was on an average 500 yards wide. Destroyers were moored in groups of six to one buoy, which was about 300 yards from another buoy. The larger ships were 500 yards apart. In addition a ferry crossed as noted in the sketch (Fig. 1). The tidal current at the flood or ebb was on an average from three to five knots. The term "crowded harbor" could at most times be correctly applied, and the situation demanded a quick turn. In meeting this situation I used the following general plan: Referring to Fig. 1, I would stand into the harbor at 10 knots (required by the force commander's orders), until abreast of the *Melville*. Here I would ring "standard speed" (15 knots); and steer the course indicated by the dotted line. Immediately after passing the *Charleston* (note flood tide), "Right rudder, 25 degrees," "Starboard engine stop," and waiting for the ship to start swinging rapidly (about 15 seconds) "Starboard engine back two-thirds." The headway of the vessel was gradually slowed by the backing engine, and by the time the ship was half through the turn (point R), I was able to size up the situation ahead, and, if a bit doubtful of the sea-room would give "Port engine ahead two-thirds." The effect would of course further slow the headway, but, having the engines adjusted, the vessel still kept a little headway, and continued to turn. Usually, I found that this was all that was necessary to complete the turn. However, in some cases when a strong wind was blowing on the starboard bow, I could see soon after passing point R, that there was not room to complete the turn. In this case "Port engine stop," "Shift the rudder" (as soon as the vessel lost headway), and back. On gaining sternway, the stern either fell off to port, or held steady. After going astern, as far as I had room, "Port engine stop," "Port engine ahead standard" "Shift your rudder" (as soon as the vessel loses sternway). After gaining headway, backing the starboard engine would generally complete the turn.

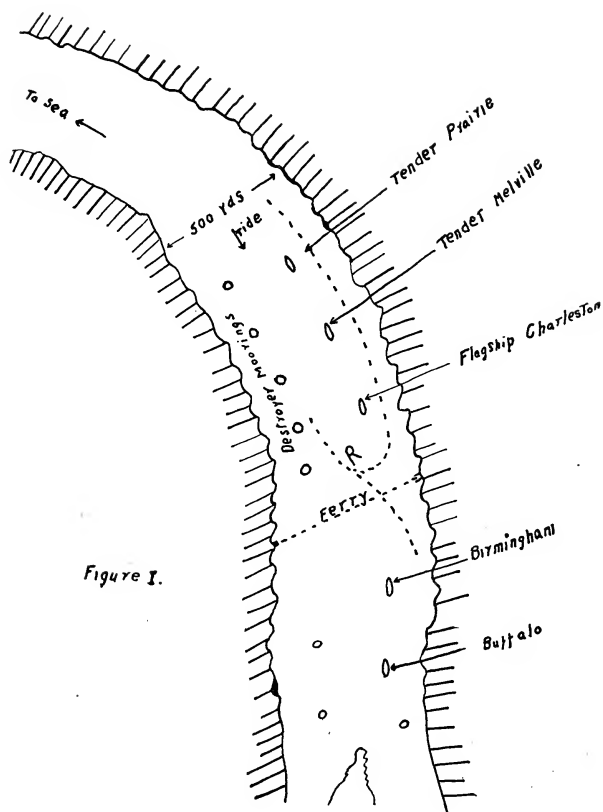


Figure I.

In giving this concrete example of turning, I have in mind some fundamental ideas that were illustrated therein, and which I reiterate for emphasis:

(a) Size up the situation before starting the maneuver, and pick a turning ground that is relatively clear.

(b) Before starting the turn, get good headway on the ship.

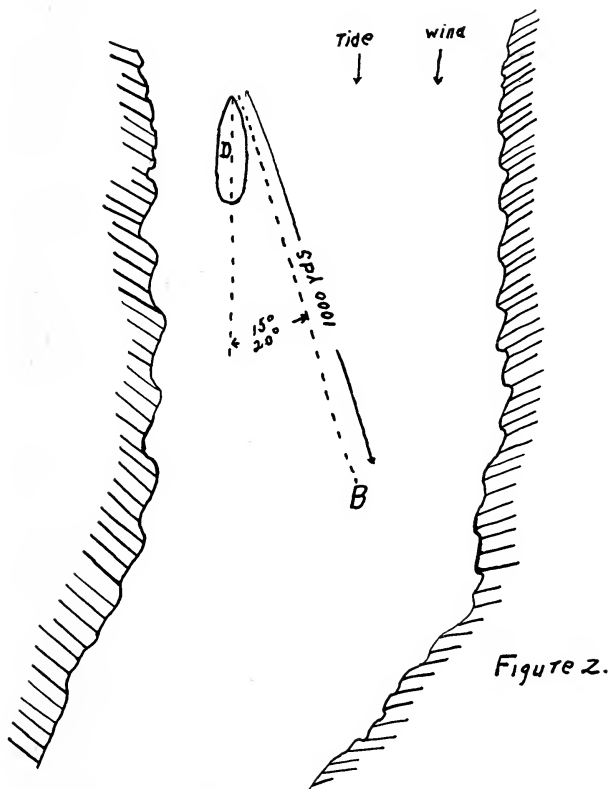
(c) Use the power that you have. You will notice that standard and two-thirds were used entirely, and the full kick of the propellers thus secured. At the same time, the headway of the vessel was killed by the backing engine, thus keeping the situation well in hand. The use of power is, therefore, not poor seamanship, and the idea must be differentiated from speed through the water. I have watched destroyer skippers try this maneuver of turning, with favorable conditions, in San Diego harbor, and back and fill for a half hour, to the discomfiture of other shipping, their own crews, and themselves, because they would not use more power than two-thirds.

(d) In case it is necessary to back, go astern as far as possible; or, if this total distance is not necessary, back until you are sure there is room ahead to complete the turn.

In discussing the subject of turning, you no doubt noticed that reference was made to the effect of the wind. The design of a destroyer requires you to keep the effect of the wind constantly in mind. This factor must be considered in sizing up the situation before starting the turn. It is good practice to make the turn, if possible, so that the bow of the ship will go through the wind shortly after starting the turn. At the same time remember that a destroyer tends to back up into the wind sharply. One captain overcame the effect of the wind on the bow of his destroyer, by keeping the after awnings spread and the vessel down by the head.

We have now carried this discussion up to the problem of taking a destroyer alongside another vessel or dock. As the method is the same whether going alongside a vessel or a dock, the more frequent case of going along side another vessel will be considered.

Let us, therefore, take the situation as represented by Fig. 2, with practically ideal conditions of wind and tide, and see how to go about making a landing. Before starting to stand in on the course to bring the destroyer alongside, maneuver the vessel approximately into position *B*, at which place the engines will be making two-thirds speed ahead and the distance from the bow



of the vessel that it is desired to moor to, *D*, will be about 1000 yards. From this position, head in on a converging course of approximately 15 degrees, keeping the jack staff of vessel *D* a little open on the inboard bow. When about 400 yards astern of *D*, slow to one-third speed and steer a course to bring the jack staff of *D* finer on the bow. When 100 yards astern of *D*, stop, and when the bridge passes the after deckhouse of *D* back two-thirds on both engines. As soon as the headway is checked, stop the inboard engine. When the headway is killed, or in time to land in position alongside, stop the outboard engine.

You no doubt readily agree, that the maneuver of making a landing is one in which judgment of distance is of primary importance. In developing this judgment (seaman's eye), I have found it most advantageous to follow the general plan outlined above. Into this plan I fitted, by mentally estimating, the effects of the local conditions of the wind and tide, and then proceeded with my general plan, modified to meet these conditions. I believe that you will have good success in following this method, if you consider these points during the maneuver, namely:

*First.*—Get a long reach, and come in at an angle of 15 to 20 degrees.

*Second.*—Make the landing at slow speed. I have noticed that the more experience a destroyer captain has, the more slowly he goes alongside. Everyone will admit that a 15-knot landing and backing down full is pretty, but the fellow you are going alongside of has some rights, and possibly prides himself in the looks of his ship. Also remember that these are the "piping days" of peace and that the powers-that-be want to know why in case of a smash-up.

The above plan for going alongside should be followed, whenever conditions, as will be generally the case, can be made to fit. Local conditions, however, may make it impossible to follow this plan, in which case the problem may be attacked, in the following manner: Referring to Fig. 3, suppose there is not sufficient room astern of destroyer *D* to make the landing as illustrated in Fig. 2, and that other conditions are such that we must take *B* as the starting point.

In this case stand-in on course *BR* (dotted line) at two-thirds speed, keeping as far over to the left as possible. When at *R* stop both engines, and put the rudder hard right. Back two-thirds on the starboard engine, at the same time steadying up with the



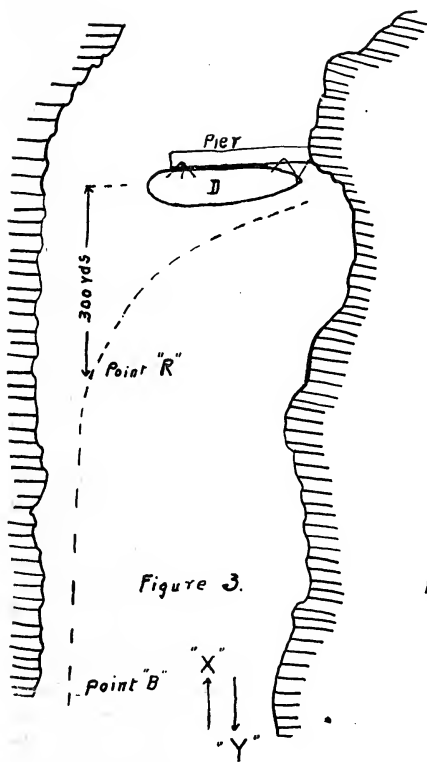


Figure 3.

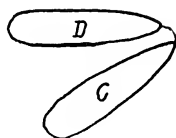


Figure 4.

jack of *D* on the port bow. The ships will by this time be in the relative positions indicated by Fig. 4, and the problem becomes one of "walking the stern in" with the engines. To do this, keep the rudder right, go ahead one-third on the port engine, and continue to back two-thirds on the starboard engine. The destroyer *C* is still going ahead slowly at this point. Get out a bow line, but leave it slack, and when the bow of *C* has overreached *D* about 10 yards, stop the port engine and put the rudder amidships. As soon as the ship *C* starts astern through the water go ahead two-thirds on the port engine. The effect of the starboard engine backing, and the port engine going ahead will be to kick the stern to port, and it is this kicking effect that the term "Walking the stern in" implies. When *C* and *D* are almost parallel stop the engines, and moor with the lines.

This maneuver requires exceedingly good judgment and is made very difficult, if not impracticable, when there is a tide and a wind. Referring to Fig. 3, if the resultant force of the wind and tide is as indicated by *X*, due allowance must be made for this set towards *D* while turning from point *R* and paralleling *D* with the engines. On the other hand, if the force is as indicated by *Y*, the bow of *C* must be placed close alongside that of *D* and full power used to walk the stern in.

Before passing to the methods of getting underway from alongside another vessel, I should like to point out that, due to the good steering qualities a destroyer has when making sternway, it is possible to back alongside. One of the prettiest cases of backing down that I have seen was made by the commanding officer of the U. S. S. *Simpson* when he placed his ship alongside the port side of the *Cuyama* in the Bay of Santiago del Sur, Chile, January, 1921. In making this landing the wind was from astern. The maneuver was made by backing two-thirds on both engines on a course that paralleled the *Cuyama*, and which was about 25 feet away until the stern was one-third of a ship's length from the bow of the *Cuyama*. Both engines were then stopped, and the rudder put left momentarily to start the stern left, and then shifted to amidships. As soon as the rudder was amidships, both engines were signalled standard ahead. In this maneuver it is the handling of the rudder that must be carefully watched, for it is apparent that if the rudder had remained left, and then the engines had been

put standard ahead, the stern would have swung right, and possibly into the *Cuyama*.

The problem of getting underway from alongside another vessel is generally solved by backing away, and this method has more advantages than the method of going out ahead. The tender part of a destroyer is the propellers, and by keeping them clear one avoids much trouble. Backing away has the advantage of getting the sterns apart and the propellers free from danger. It is for this reason considered the better plan. It is also frequently the only practicable method, as when getting underway from between two vessels.

In making this maneuver, I found it the best plan to back one-third on both engines, with the rudder amidships. On gaining sternway, the bow usually fell off to one side or the other, but this tendency could be met by putting the rudder right or left, as the case demanded. My plan was, therefore, to go astern on a parallel course. For example, suppose that you are moored starboard side to. The first order would be "Rudder amidships," "Both engines, back one-third." As the vessel gains sternway, suppose the bow falls off to starboard. When this tendency is first noticed, put the rudder right 20 degrees, and then, if the rudder effect is not sufficient, stop the starboard engine. As the destroyer goes astern the kick of the propellers will force the ships apart.

The maneuver of going out ahead from alongside another ship requires particular attention to the rudder. If moored starboard side to I found it best to put the rudder right before giving any orders to the engines, and then to go ahead two-thirds on the port engine. In this manner, the stern did not swing to the right before the full effect of right rudder took charge, as would have been the case if the rudder was given "Right rudder" after way was on. This trick in handling the rudder is worth remembering. I have seen destroyers rub the side of another vessel time and again when going out ahead, and am firmly convinced that it was all due to waiting until after way was on before putting over the rudder.

The ordinary situations that a destroyer skipper has to meet in moving his ship have been presented to you, while the exceptional, or trick maneuver has been avoided. As pointed out in the introduction, it was the intention of the writer to help bridge the "gap" for the novice destroyer commander. But after all, actual experience is the only method that will perfect you, and no amount of reading can replace it.



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## THE STEREOGRAPHIC PROJECTION FOR STAR IDENTIFICATION AND STAR "SPOTTING"

By G. T. RUDE, Hydrographic and Geodetic Engineer,  
U. S. Coast and Geodetic Survey

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It is evident that in general problems which lend themselves to solution by means of tabular values may also be solved by the use of some graphic device. While this may in some cases entail a slight decrease in accuracy for theoretical problems, it is unquestionably sufficiently accurate for all practical purposes. A diagrammatic solution has the advantage however over tabular or computed solutions of requiring far less time and further that the results may be more easily and quickly grasped, the diagram tending to transform an abstract problem into concrete form.

With this idea in mind the writer, while navigator of a troop transport during the war, conceived the idea of employing a graphic means of star identification to take the place of star identification tables which at best are far from satisfactory. The stereographic projection was selected as the one best adapted to the purpose. The accuracy of the results obtainable and the fact that almucanter circles could be introduced, admitting of identification by altitudes only, justified the use of this projection. The introduction of the almucanter circles further made possible another application which may be called "Star Spotting" for lack of a better term. This permits the location of stars and planets very expeditiously and closely in azimuth and altitude before they become readily visible to the unaided eye, thus allowing the navigator to secure star observations while the horizon is clearest—immediately after sunset.

In the PROCEEDINGS for September, 1921, Lieut. Commander L. V. Keilhorn, U. S. C. G., in his article "Approximate Altitude and Azimuth" illustrated an interesting, practical use of the stereographic projection for securing altitudes and azimuths. He made

use of the horizon projection, plotting the celestial bodies as occasion arose by means of hour and declination circles. The present writer employed two applications of the stereographic projection—the polar projection on which the celestial bodies are permanently plotted by means of their tabulated right ascension

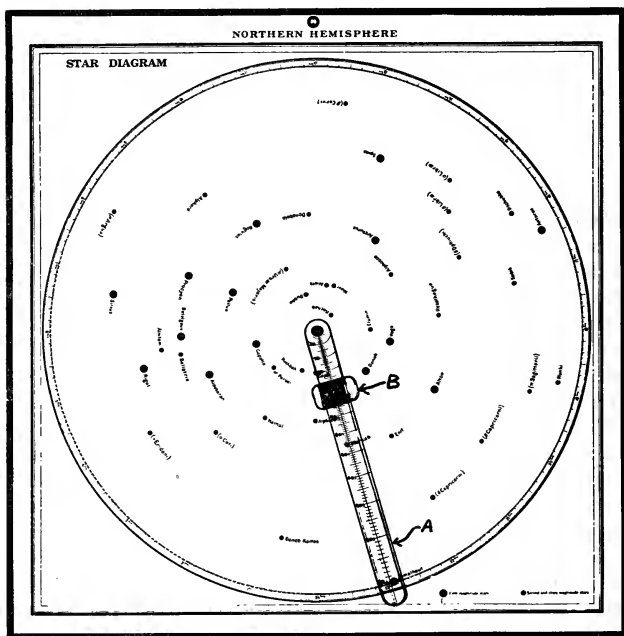


FIG. 1.

and declination, and the horizon projection on which are projected the zenith of the observer and azimuth and almucanter circles for the latitude of the observer.

By locating on the polar projection the zenith and meridian of the observer, and then superimposing upon these the zenith and meridian of the horizon projection the two projections are combined and altitudes and azimuths of celestial bodies for the posi-

tion of the observer may be read by inspection from the horizon projection which is constructed on a transparent material.

Fig. 1 is a diagram of the northern celestial hemisphere on a polar stereographic projection, extending from the pole to declination  $30^\circ$  south. To obviate the confusion which the declination circles would cause when combining with the horizon projection, these are omitted from the drawing of the polar projection, and the necessary graduations for declination are supplied by means of a graduated revolving transparent arm (*A*, Fig. 1). The periphery is graduated for right ascension in hours, subdivided into

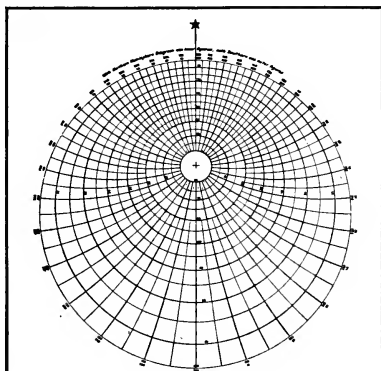


FIG. 2.

10- and 2-minute intervals. First magnitude, and some second and third magnitude, stars are permanently plotted on the projection by their declinations and right ascensions. The projection may also be used for the planets by plotting their positions occasionally. For the southern hemisphere a similar projection is used, extending from the south celestial pole to declination  $30^\circ$  north, thus allowing an overlap of  $60^\circ$  of declination on the two projections.

Fig. 2 is the stereographic horizon projection constructed on transparent celluloid for latitude  $45^\circ$ , N. or S. These may be called "Templates" for convenience. Results of sufficient accuracy for practical purposes can be secured three degrees either side of this parallel of construction; that is, from latitudes  $42^\circ$  to  $48^\circ$ ,

either north or south latitude. It is evident therefore that 11 such templates will cover the earth between latitudes  $66^{\circ}$  N. and  $66^{\circ}$  S—for practical purposes, the whole navigable world.

The cross near the center is the projection of the zenith of the observer; the starred straight line his meridian; the curved lines radiating from the central circle are azimuth circles graduated to each  $5^{\circ}$ , the heavier lines indicating the even tenth degree and the lighter the  $5^{\circ}$  intervals, and the nearly concentric circles numbered from  $20^{\circ}$  to  $80^{\circ}$  are almucanter or altitude circles for each  $5^{\circ}$ , the even tenth degree being accentuated by a heavy line as in the case of the azimuth circles.

When the celluloid horizon projection, or template, is used in connection with the polar projection (Fig. 3) on which the celestial bodies are plotted, the azimuth circles will indicate true bearings of these bodies from the observer for every  $5^{\circ}$  and the altitude circles true altitude, beginning with altitude  $15^{\circ}$ , which is the lowest circle constructed. The bearing and altitude, however, of any body falling between these lines may be readily estimated to the nearest degree. The figures at the ends of the azimuth lines indicate actual values of azimuth, the inner figures for the northern hemisphere and the outer for the southern.

With star diagrams and templates constructed on these projections as outlined above the navigator may determine at a glance for any dead reckoning position the following: The azimuths of celestial bodies with sufficient accuracy for plotting position lines by the Marcq St. Hilaire method; in advance the navigation stars and planets which will be visible at twilight or dawn; the approximate altitudes and azimuths for any given time of stars and planets ("Star Spotting"), and the identity of any star or planet, the altitude of which has been observed and its bearing estimated only, without actual compass bearing.

While the use of 11 templates, employing each template through  $6^{\circ}$  of latitude, makes the use of the projection practically universal, it is evident that all these templates will very seldom be required, depending of course, upon whether or not a vessel makes considerable change in latitude. On a vessel bound from New York to Liverpool only three templates would be necessary; from New York to the Mediterranean only one would be needed throughout the entire voyage.



When used on or near its parallel of construction altitudes and azimuths indicated by horizon projection template will agree very closely with observations or computed values. As departure is made from this parallel, altitudes and azimuths in general will differ not more than a degree from these values, even when  $3^{\circ}$  in

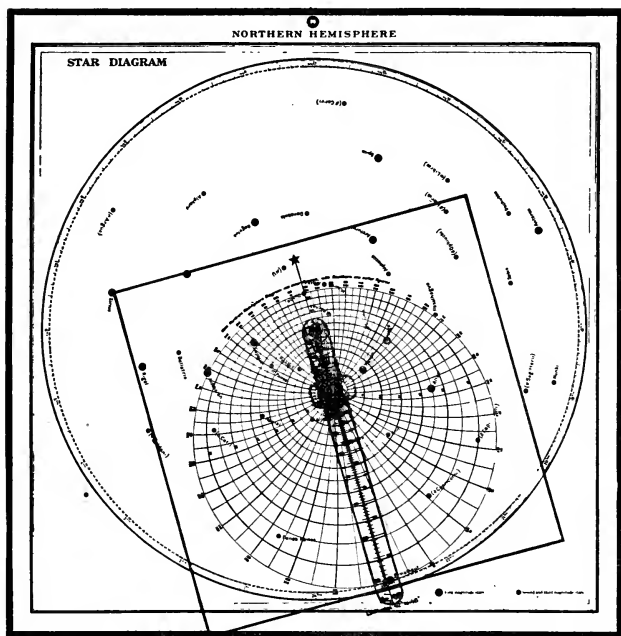


FIG. 3.

latitude from the standard parallel. This is shown in the examples given below.

Since the projections may be used both for star identification and "star spotting," examples of both will probably best serve to illustrate the method of use and accuracy of results.

"Star Spotting."—At any convenient time the probable dead reckoning position of the vessel for the estimated time of observa-

tion is roughly determined. Bearings and altitudes of suitably located stars may then be obtained graphically for that estimated time. These values may be set on pelorus and sextant to bring the desired star within the field of the telescope. The example following will serve to illustrate the procedure:

On December 25, 1921, in Latitude  $44^{\circ} 10' N.$ , Longitude  $25^{\circ} 15' W.$ , required to determine the names, approximate altitudes and bearings of navigation stars visible above  $15^{\circ}$  altitude at 15 minutes after sunset.

Solution:

	h	m
L. M. T. of sunset .....	4	27 15
L. M. T. of observation .....	4	42
R. A. M. S. December 25th to nearest minute.....	18	14
Red. for G. M. T.....		01
Local Sidereal Time.....	22	57

By revolving the celluloid arm (*A*, Fig. 1) to the local sidereal time on graduated periphery of diagram and sliding the movable marker (*B*) to the degree of declination on the graduated arm corresponding to the dead reckoning latitude, it is evident that, since latitude equals declination of zenith and local sidereal time the right ascension of the observer's meridian, the center of the marker is the projection of the observer's zenith on the polar projection, and the center line of the arm the observer's meridian.

Superimposing the horizon projection on the polar projection (Fig. 3), pole toward pole, zenith over zenith and meridian over meridian, it will be seen that the two projections are conformable, and by reference to Fig. 3 (before photographing projections were oriented to the time and latitude of this example) the following stars on the polar projection will be seen through the transparent horizon projection, their bearings indicated by the radiating azimuth lines and their altitude by the nearly concentric almucanter circles. The first columns are the graphic values from the projection and the second columns are computed values, a comparison of which will furnish an idea of the degree of accuracy obtainable.

The graphic values were taken by inspection from the writer's projections, the polar one being 16 inches square which allows of a sufficiently large scale to take out the values with a fair degree of accuracy, and at the same time is a convenient size for practical use.

	Altitudes		Azimuths	
	Graphic	Computed	Graphic	Computed
Capella .....	27½°	28° 01'	52°	51° 45'
Aldebaran .....	15°	15° 48'	82½°	82° 15'
Altair .....	35°	35° 45'	244°	244° 00'
Deneb .....	65°	65° 35'	285°	284° 30'
Vega .....	41°	41° 48'	287½°	287° 15'

The results tabulated above were obtained for a latitude (44° 10') very close to the parallel for which the template was constructed (45°). The values below, however, were obtained for a latitude 3° distant from the parallel of construction; that is, Latitude 48°. It will be seen that the graphic determinations, even under the extreme limits of difference in latitude under which a template is used, agree very closely with computed results and that the determination of azimuth is in this case sufficiently accurate for the plotting of Marcq St. Hilaire position lines.

	Altitudes		Azimuths	
	Graphic	Computed	Graphic	Computed
Capella .....	30°	30° 21'	53°	53° 30'
Aldebaran .....	16°	16° 16'	84°	83° 20'
Altair .....	35°	34° 00'	242°	241° 30'
Deneb .....	66°	66° 14'	277°	275° 40'
Vega .....	42½°	42° 51'	284°	284° 10'

Star Identification.—For the identification of stars by means of these projections no compass bearing is necessary; the bearing of the body may be estimated only to the nearest point or so and the identification made absolute by means of the observed altitude and the almucanter circles of the horizon projection.

To illustrate, suppose that on the evening of December 25, after having previously determined the positions of the large stars as in our last example, none showed because of clouds, but that at G. M. T. 6<sup>h</sup> 23<sup>m</sup> 00<sup>s</sup> through a break in the clouds an altitude of 46° 41' 30" was observed of an unknown star of second magnitude, a little south of East. Required the name of the unknown star?

Solution:

	<b>h</b>	<b>m</b>
G. M. T. ....	6	23
Long (25° 15'W).....	1	41
<hr/>		
L. M. T. ....	4	42
R. A. M. S. December 25, 1921.....	18	14
Red. for G. M. T.....		01
<hr/>		
Local Sidereal Time.....	22	57
Dead Reckoning Latitude.....	44°	10'

As in the case of the last example the zenith and meridian of the observer are located on the polar projection and the horizon projection superimposed and oriented.

Reference to Fig. 3, on which the template was placed for these examples before photographing, will show the star, altitude 46°, bearing 102½° (a little south of East) to be Hamal. This is the only second magnitude star in that general vicinity of the heavens at that altitude and it is therefore evident that only its approximate direction is necessary, the altitude serving to identify it.

To sum up, by the use of 2 star diagrams and 11 templates constructed on stereographic projections, the following data for all the navigable waters may be expeditiously obtained by the navigator:

(a) Determination of azimuths of heavenly bodies with sufficient accuracy for plotting position lines by the Marcq St. Hilaire method.

(b) The names of navigation stars which will be visible at twilight or dawn.

(c) The predetermined approximate altitudes and azimuths for any given time of navigation stars ("Star Spotting").

(d) The identity of any navigation star, the altitude of which has been observed and its bearing roughly estimated.

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## MISTAKEN PUBLICITY

By LIEUTENANT C. K. BLACKBURN, U. S. Navy, Retired

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The navy is at present facing a very serious misunderstanding throughout the country due to mistaken publicity. The public in general sees the navy only through reports given in the press. The press notices that are given, particularly in inland cities never deal with any activity of the navy except the celebrations and reviews which are special occasions.

Few people outside of those intimately connected with the service realize that a peace-time navy is a working organization. Most of them seem to feel that naval officers and enlisted personnel are on a constant joy-ride and are always in dress uniform and at social functions. The future of the navy seems seriously menaced by this misunderstanding.

Inland congressmen are representing their constituency when they vote against naval appropriation bills. No one cares to see his money wasted on constant entertainments in which he does not have a part. If the workers and voters generally can be brought to realize that the navy in peace times is really a harder working organization, if anything, than in war times a portion of the dissatisfaction that naval appropriations cause will be remedied.

We of the service know that preparation for war is as serious a proposition as the actual warfare itself. We realize that we are devoting our energy constantly to matters which are of service to the country in general and to the individual voter. If this viewpoint can be brought home to the individual American it will be of value to the navy and to the country.

It seems logical that navy publicity can be transferred from its present endeavors of impressing the populace with its value as a social organization to its value as a working organization. The field of navy work is something which has been hardly "touched" in the public press.

There is nothing spectacular about our daily routine of life on board ship, but there is a great deal of value which can be brought to the minds of the individuals by constant impression. When the fleet goes to Guantanamo for winter exercises, officers and crew are headed for a period of hard work seldom equalled or exceeded in civilian life.

The routine of daily navy life at such periods could be so detailed and explained that it would bring to the country at large a message of the amount of work required to keep a navy ready for war.

Target practice itself is of sufficient spectacular interest to provide reading matter which would be as satisfying to the reader as the present news of the navy and its social activities. The individual activities of the fleet with the strategic maneuvers and tactics necessary to enable them to be successfully made should be a subject of fascinating interest to the average reader. It seems a shame that the people of this country are permitted to believe that naval officers are on dress parade constantly. Every time the fleet comes to port the papers are filled with the reports of entertainments ashore but never a word is written about the strenuous labors previous to arrival in such port.

Speaking personally, I know that the hardest work that has ever been my lot came when I was with the fleet and preparing for target practice, when the day started at 6 a. m. and work was never completed until at least 8.00 o'clock at night.

Cruises of the navy to foreign ports are made the subject for general rejoicing and specific advertising for recruits for the service. The value of such cruises to the commercial interest of the United States has never been sufficiently advertised. By such visits to foreign ports, strangers are given an idea of the power of the United States which is likely to make them feel that the United States is a great enough industrial country to make it worth while subject for consideration.

I do not mean to say that it is not now generally realized that the United States is a great industrial country, for such a statement would be far from the truth. But the navy's visits do tend to give a feeling of international amity which is not realized in any other way. Many people who do not come in touch with the United States in their ordinary life get a friendly feeling for the United States from getting in touch with the enlisted men and officers of naval vessels.

When President Harding reviews the fleet in New York, papers all over the country give a column to the account of the review but when some vessel in the navy breaks the record for target practice it is possible that a paragraph "squib" may possibly reach a few papers in the country. Surely the latter endeavor is the one which is of value to the country at large and particularly to the service.

The officers and enlisted men of the navy are earning every cent of their pay. Their time is almost always occupied with work which is not play in any sense of the word. Down in the bunkers, in the hot engine rooms, in the magazines and in the turrets they are putting every effort into preparing their ship for any serious trouble that may occur. They are ready to go ashore at all times to protect the interest of their countrymen. Their lives are their country's and they are not in the navy for the entertainment which the service is granted on their occasional visits to port. The activities of the navy detailed above are all excellent subjects for newspaper or magazine articles.

The purpose of this article is to bring home to the service the extent to which their activities are being misrepresented by allowing so many articles on entertainments for the navy and not seeing to it that such articles are counterbalanced by other articles on the workaday navy. Surely the newspapers of the country would be as well satisfied to receive an article on the working navy as they are to receive one on the playing navy. The amount of time that the navy spends on playing is so small a percentage of their total time that the injustice of present publicity is doubly noticeable.





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## BUSINESS AND NAVY FOOD

By COMMANDER M. H. KARKER, S. C., U. S. Navy

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1. The current business depression and unsettlement has served to bring home to most of us the realization of how little we know about economic cycles and the factors of business organization and administration. Forces of tremendous power and unalterable determination work their will in business with greater precision and with more persistent pressure than in politics, religion or international relations.

2. Since the days of simple barter man has recognized the fact that presumably uncontrollable forces were at work but he invariably laid their results at the door of local politics or an unfriendly neighbor. The necessity for education in business functions has been recognized only within recent years but its results have been so remarkable as to make such education a fixture in the preparation of young men for all future time. Already we have learned what these forces are and much of how they work. The time is coming when we will be sufficiently enlightened to know that they may be controlled and then the rigors of depression and the excesses of "prosperity" will be abolished.

3. There is a law in physics called the law of equal and opposite reaction. It applies with equal force in economics. So applied, it means that times of feverish prosperity and extravagance are followed inevitably by periods of equally dull business and hard times. Society is so imperfectly organized that we humans are unable to "keep our feet on the ground" or the ship of business on an even keel and straight course. We of the navy need not now interest ourselves in the *causes*. It is enough to recognize the *fact*, and to prepare ourselves to act in harmony with the movements as they occur.

4. These periods of prosperous times occur about once in every seven years (on the average) and during such times the prices of all commodities are high—just as in hard times they are low. But between the high and low points of inflation and depression there are intermediate movements in prices and in the volume of business. Plotted on a chart these movements look like a series of mountain peaks, but the *trend* is either up or down. Now it is the function of business in commodities, such as food, to purchase at the lowest price practicable; to handle, store and ship with the least expense; and to sell at the highest price obtainable. It is very easy to make money in times of prosperity and much easier to lose money in times of depression.

5. The navy is in business just as truly as are Austin Nichols or Washburn Crosby—the only difference being that we do not sell at a profit. In addition to the fact that we do not sell at a profit we are bound to maintain our stock on a basis of proper naval preparedness, a policy which forbids our working on reduced stocks in times of depression. But if we would be sure to gauge fairly the success of any supply unit we must secure affirmative answers to these questions:

(a) Is stock always available for issue?

(b) Is the amount of stock on hand reasonable, *i. e.*, is it less than the average issues for eight months?

(c) Are the issue prices on a par with, or lower than, current market quotations?

If the answers to those questions are “yes,” then we may know that the supply officer concerned has followed the economic trend; has expended the government’s money as he would his own and is prepared to meet the material needs of the navy. If the answers are not affirmative then something is wrong, either with the supply officer or with the policy under which he has been directed to work.

6. No large success is possible in navy supply work without the application of right principles. A constant study of the economic and commodity trends makes the storekeeper or purchasing officer efficient and valuable to the navy we serve. But business is burdened with ill considered and undigested writings on economics—writings replete with catch phrases and high sounding terms. It will be found something of a task to separate the wheat from the chaff but every grain of fact winnowed from the mass will return a hundredfold. Ultimate success will make this work pay.

7. "Business" is not a specialty to the supply corps. It is the basis upon which all supply functions are founded—the keel and ribs about which we build purchase, disbursements, supply and accounting. Business in food is a specialty, however, and one about which a reasonable amount of knowledge is required in the course of general supply work. Without a background of history and fundamentals storekeeping becomes a monotony and commissary work a pest.

8. Provisions and clothing are no more alike than saltwater soap and anchors. But we invariably name them together because they have been allied by tradition. The Bureau of Provisions and Clothing (among a number of others, some of which survive) was established by the Act of 31 August, 1842. That was the beginning of the present Bureau of Supplies and Accounts and the name was not changed for 50 years. The old-time paymaster aboard ship issued clothing to the crew; issued uncooked provisions to the berth deck messes and kept the pay accounts. In those easy-going days even our storekeepers ashore were civilians. But since then we have had the growth of purchase; sales; general storkeeping and accounting—to the present group of widely different professions making up the supply corps job and in which a supply officer is supposed to be equally and highly proficient.

9. From the establishment of the bureau in the navy department, food and clothing grew up together. Tradition and practice linked their names until the development of the navy forced their prime importance, and the necessity for specialization, upon the attention of the bureau. In the growth of our allied professions, the primary importance of victuals and clothes was relegated temporarily to a secondary position. With the establishment of the P. and C. Depot in 1907 the Department awakened to the fact that the old specialists had been retired and that no new ones had been trained to take their places. Courses of study were arranged with the Philadelphia Textile School and with the Department of Agriculture in Washington and a small number of officers was trained in the fundamentals.

10. With the establishment of the P. and C. Depot began the coordination of all P. and C. supply effort, including that of the naval clothing factory which had been started in 1879. Since 1907 one agency has undertaken the responsibility for specifications, upkeep, manufacture, inspection and distribution. Handled in

detail by one agency, it is not surprising that the *methods* of handling food and clothing are almost identical—that reports of both are made in the same form—that a special requisition and invoice are used when the supply officer afloat needs stock—and that one division of supply departments ashore is “P. and C.”

11. But there are differences in financing and accounting that push them almost as far apart as do the differences in physical characteristics. Provisions are purchased under an annual appropriation which also provides for many expenses other than the cost of food. The amount which may be spent in any one year, therefore, is definitely controlled and fixed by the Congress and it means that the Bureau of Supplies and Accounts must be careful—even niggardly—in expenditures for labor in handling provisions. Congress is extremely shy in appropriating money for the navy and it places upon the Bureau of Supplies and Accounts the proper business burden of seeing to it that *food reaches the mess table at the lowest possible cost*. One can readily understand the effects on the ration of the unit prices paid for food and of expenditures for handling. If the amount spent for labor in provisions storehouses was not kept to the very minimum there would be no money left for the purchase of food itself and for the payment of commuted rations. And if we paid an excessive price for pineapple no supply officer could afford to issue it and the men would lose variety.

12. The expenditure or use of food is likewise rigidly fixed by law. The quantity of each class of food allowed each man each day has been fixed and issues must be accounted for by rations—a sometimes intricate, but always interesting, proceeding. The allowed variations are legion and I know of no more absorbing occupation than the administration of a general mess and the preparation of its returns. The proof of success is the excellence and variety of bills of fare and the unit cost of the ration.

13. The purchase of clothing and small stores is financed in an entirely different way. The clothing and small stores fund is a revolving and self-supporting fund now amounting to slightly over \$42,000,000. That is our capital. Its profitable employment means constant care to keep enough invested in actual stock to meet issue needs but not so much invested in overcoats that there is no money to buy undershirts. As the men pay (directly or through allowance) for all clothing issued to them, the accounting

is a simple ledger return at fixed prices. For certain good legislative reasons the ledger prices are not fixed at this moment but it is only a question of a short time before uniform ledger prices will be re-established.

14. There is a general impression that men eat and wear the same things and in the same quantity year after year and that there is never any excuse for failure to have macaroni and gym shoes in stock. Nothing could be farther from the truth. Upkeep and distribution of food and clothing are not mere matters of mathematics. They depend upon climate, appetite and the distribution of naval forces. The problem in all storekeeping is not "always to have enough." That is the simplest thing to require of any human being and belief in it has caused some monumental failures. The real requirement of storekeeping is always to have enough *without ever having too much*—to meet legitimate naval needs without an excessive "inventory" and without the burden of losses by survey. To fulfill that requirement means hard work and close attention—attributes that lead to success everywhere and in every kind of job.

15. The office of P. and C. administration at the navy supply depot is charged (under the direction and control of the Bureau) with responsibility for food and clothing. That office probably exercises closer supervision over stocks in hand than is possible or in practice with any other class of navy materials. In working out the distribution of food and clothing it early developed that a record of *all* the stock in the navy would be impractical. So the control of quantities aboard ships and at the smaller yards at home and abroad is left almost entirely with the respective supply officers. Among the many continental yards and stations, however, there are seven which do the bulk of the navy supply work and these are termed primary points of distribution. They are Boston, New York, Philadelphia, Norfolk, Great Lakes, Puget Sound and Mare Island. Even these points are subject to change.

16. In the office of P. and C. administration there is maintained an accurate record of the stock of each item of food and clothing on hand at these primary points. This record is posted from a regular monthly report rendered by each of the seven supply officers. By means of this record the bureau is always in touch with the quantities available and—by elimination—with the quantities being consumed at each point. If Boston runs low in beans

we know immediately whether they can be supplied from some other yard or whether an additional purchase is essential. If the fleet should be moved suddenly from the Pacific coast, we would know exactly what food and clothing might be transferred from Mare Island and Puget Sound to the east coast yards and the shipments would be made to arrive almost simultaneously with the fleet. We depend upon this record—and it seldom fails—for essential information as to the quantities required to keep the navy supplied.

17. Each of the primary yards and stations is assigned a definite quota or proportion of the stock of food and clothing available for issue. These percentages are changed as the ships change home yards and as the appetites of the men develop. The work of P. and C. administration is not paternal to the extent of assuming all responsibility for the maintenance of stock but when the supply officer at Mare Island submits a requisition for tomatoes it is our job to recommend to the bureau a change in, or approval of, the quantity asked for and to designate a source of supply. When determining upon purchase and shipment, P. and C. keeps one object in view always—to get the food and clothing to the actual consumer with the least possible expense.

18. In the supply of food to the men of the navy no other bureau or office shares responsibility with the Bureau of supplies and Accounts. The supply corps of the navy must alone assume full responsibility for the quality, kind, price and service of the navy ration.

19. All supply officers who have been to sea are familiar with the general mess and the difficulties that beset the preparation and service of food. We all know that the ship's cooks rank with (but after) the engine room force in being difficult to handle properly and we know, to our sorrow, how quickly soup gets cold and ice cream melts. The commissary officer and the commissary steward have jobs that are envied by few—but jobs that are exceeded by none in their possibilities for the promotion of contentment and the making of a happy ship.

20. The supply officer who goes to sea is so in the habit of finding all his necessary dry stores forthcoming when he submits a requisition that he is apt not to think much about how those stores came to the storehouse or where they came from. He is apt to think of coffee as something he drinks in the morning and of

raisins as a bunch of seeds in rice pudding. But somebody in the navy is continually thinking of coffee as a bean grown in Brazil and of raisins as grapes in California. It is that phase of provisions supply work that merits more attention.

21. The navy specifications for food are very rarely the product of entirely original thought and research. Most of the food we eat has been in common use for hundreds of years—only the standards of purity and grading change from time to time. But at the navy supply depot there is a force of officers and specialists engaged continuously in keeping abreast of the developments in the growing, handling and packing of food products and these men spend a very considerable part of their time in original research work in an endeavor to improve the quality or the grade or the packing of navy food without increasing ultimate cost. In all of this work the force on specification revision keeps in mind the ultimate consumer—the man aboard ship who answers mess call and who must eat what is put before him.

22. After the preparation of the specifications comes the question of how much to buy and where to keep it. The question of storage is a much simpler one than the question of quantity, for while all foods are perishable, some are more perishable than others and the stock of these must be replenished with greater frequency. No amateur would attempt to keep rolled oats for the same length of time as sugar and it becomes a nice question as to what length of time food may reasonably be expected to keep without deterioration. Some years ago the Bureau of Supplies and Accounts investigated this subject very thoroughly and published in the *Bureau Memoranda* a table of keeping qualities of food. A study of this table, and a careful compliance with its instructions, will pay the commissary officer many times over in the reduction in the cost of ration through smaller losses by survey. When you determine on your requisition to fill stock do not, by any chance, attempt to carry the more perishable items for the same length of time that you can carry tinned fruits and the standard vegetables.

23. All food is not harvested and marketed at the same time of the year. A number of the less important items are continuously available—perennials, as it were. But most of the items of navy food have their greatest period of production at the same time each year and the navy—like any prudent housewife—makes its purchase when the stock is in greatest supply and the price—theo-

retically— at the lowest point. To determine the time of purchase we must consider the variation in the time of pack. As an example let us consider the case of tinned peas. Peas mature at different times in different sections of the country. They are packed in Maryland in the months of June and July, the heaviest pack running from the 15th of June to the 15th of July. They are packed in the northern states during August, September and October, the heaviest pack running from the 15th of August to the end of September. They are packed in the western states during the same months as in the northern states but the heavy pack extends only during the month of September. It is quite impossible for the navy to restrict its purchase to the peas produced in any one section of the country so we submit the requisition on or about the 1st of May of each year and the Bureau of Supplies and Accounts opens bids on or about the 1st of July. By requiring delivery on the 1st of October the navy gives every packer of peas in the country an opportunity to bid and the chance of selling his product to the service and securing world-wide distribution in use.

24. In determining the quantity to buy it has been found undesirable to rely solely upon the regular monthly reports of peas on hand. Accordingly a special report is requested from each primary distributing point about two weeks before the requisition is due to be submitted and supply officers report the quantity on hand and their own estimates of the quantity required for the succeeding 12 months. These reports and estimates are tabulated in the navy supply depot and the estimated needs compared with the average requirements published by the Bureau of Supplies and Accounts. As the navy prepares its requisition in May and as no new peas will be available until the following October, it is necessary to buy for 17 months ahead and not for 12 months. Every estimate is carefully considered and the quantity required determined—so far as human foresight makes this possible—on the basis of the men then in the navy and the authorized strength for the coming year. The determination of these quantities is not purely a matter of mathematics but involves climate, appetite and the movements of the naval forces. It is quite impossible for any human agency to foretell accurately changes in the appetite of the enlisted personnel of the navy or the preferences of supply officers in the preparation of bills of fare. We maintain stock largely on the basis of average past demands and this reliance on averages sometimes finds the



navy with an over stock in one item and under the necessity of purchasing some other item or items before the regular pack season.

25. For a number of years the Bureau of Supplies and Accounts has been endeavoring to induce producers and packers to deal direct with the navy instead of through established brokers and wholesalers. It is very evident that the price to the consumer must be increased every time the product changes hands from the time it is packed. In the normal course of civilian food distribution, food passes from the packer to the broker, to the wholesaler, to the jobber, to the retailer, to the consumer. Each of the four intermediaries between the packer and the consumer takes his profit on the transaction. Ordinarily the navy succeeds in by-passing the jobber and the retailer but still too large a proportion of our purchases are made from the wholesaler and the broker. If we could only induce the packers of the country to deal direct, it would enable us to eliminate and save two profits on every transaction. This is not a discussion of the necessity for all of these intermediaries in civilian distribution nor must it be considered a claim that their existence is necessarily an economic waste. But so far as the navy is concerned their services are unnecessary and wasteful and we should eliminate them just as soon as it is possible to convince the producers, packers and canners that business with the navy requires no special influence and involves nothing more than integrity and a desire to sell honestly described merchandise at a fair market valuation.

26. After the contracts are awarded by the Bureau of Supplies and Accounts, the navy supply depot undertakes to conduct factory inspection on as large a proportion as possible of the food for the navy. It is not possible, of course, to maintain an organization sufficient for the factory inspection of everything we buy but factory inspection is advantageous to the navy in that it demonstrates conclusively that the navy is interested in the conditions under which its food is prepared and it appeals to the seller because it eliminates the uncertainty of acceptance; expense of transportation on rejected material; and gives him payment for the material accepted within a few days after the shipment has been made.

27. All food is not inspected at the factory and in such cases, after material has been delivered by the contractor direct to the primary point which is in need of stock, the local supply officer withdraws representative samples from every delivery received

and forwards such samples to the navy supply depot for analysis, grading and comparison with the sample under which the purchase was made. It is not until the report of acceptance is received that the inspection calls are passed and public bills prepared. Every delivery is painstakingly compared with the specification requirements and with the samples submitted at the time the bids were opened, chemical and microscopical examinations are made wherever applicable and all of the gradings are verified by recognized experts of long standing. "Doubtful food is bad food" and is always treated as such. Food which passes navy inspection must not only be wholesome but it must have flavor and appearance equal to the standard and of such quality as to appeal to the appetite of the present-day fastidious sailorman.

28. It is quite impossible to cover the details of procurement, storage, inventory, issue and accounting for food aboard ship. Most of these things have been laid down by the Bureau of Supplies and Accounts in unequivocal language. If the commissary officer will take the time to study these instructions he will never have trouble in obtaining food when he wants it but unless he does his part he can't expect the supply officer ashore to do his own job and the commissary officer's too. Give the supply officer as much notice as you can when you want stores; stow provisions aboard ship so that the oldest material is always available and is used first; stow everything in regular tiers so that it may be inventoried without being broken out; invariably issue the oldest stock first and keep a close watch on the remainder so that you may be sure that you know as soon as it begins to deteriorate.

29. The preparation and service of food aboard ship is one of the most interesting of supply corps jobs. It probably presents the greatest opportunity supply officers have for constructive development and the promotion of contentment. I have never yet seen a happy ship which did not have an efficient commissary officer and the rigors of many "mad houses" have been alleviated by a good mess. In a large measure the supply officer has the health and contentment of the crew in his custody and all of his work in preparing tasteful and varied bills of fare will be repaid many times over.

30. I wish that it might be possible to indicate some of the primary sources of navy food. Familiarity makes of a bag of beans a prosaic thing and of a can of salmon only "gold fish." But, really,

they are uninteresting only if they are a detail. Coffee should mean more than a beverage. It should mean bushes in the mountains of Santos; mule trains to the coast; sweating stevedores; ships' holds; New York warehouses; expert coffee tasters; blenders and roasters; milling machines; gas heated cylinders; stoners, grinders and the final aromatic, dark brown granules in air-tight containers for the ships of the navy. Vanilla extract is something beside a flavoring for puddings and cakes. It should mean a bean grown in Mexico; transportation of the crudest sort; and the expert services of chemists and artisans in the transfer of flavor and aroma from the bean to a glycerine base. Flour is more than wheat and tea more than green dried leaves. Tinned California fruits, Wisconsin peas and Maine corn have well been named "the miracle of your table." A study of the sources of food with its gradings, preparation and distribution will pay dividends in efficiency and large returns in interest. We should give commissary work the time it needs to the end that we may discharge with credit our obligation to the men we feed.



## U. S. NAVAL INSTITUTE

### SECRETARY'S NOTES

Life, regular and associate, 5519. New mem-  
bership bers, 6. Deaths, 1:  
Lieut. E. B. Browne, U. S. N.

Practically the whole service receives the benefit of the PROCEEDINGS yet many officers, who read it monthly, are not members and therefore contribute nothing to the support of the Institute. Members are requested to urge non-members to join. Publication costs are now so high that the Institute is carrying a loss. The cost, per member, however, decreases with an increase in membership.

The annual dues (\$3.00) for the year 1922 are now  
Dues payable.

Regular and associate members of the U. S. Naval Institute are subject to the payment of the annual dues until the date of the receipt of their resignation.

Discussion of articles published in the PROCEEDINGS is cordially invited. Discussions accepted for publication are paid at one-half the rate for original articles, or about \$2.25 a page.

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The Boat Book, 1920, and The Landing Force and Small Arms Instructions, 1920, are now ready for issue. The price of the former is \$.50 and the latter \$1.00 per copy.

**Index to Proceedings** The attention of readers of the PROCEEDINGS is invited to the classified analytical index for numbers 101 to 200 inclusive, which is noticed under "Publications." This is a most complete index, which has been prepared at considerable expense in order to make readily available the information contained in both the articles and the notes of these issues. Only a limited number of copies are being printed. Price, bound in cloth, \$2.35; bound in paper, \$1.85.

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All articles and discussions submitted by persons belonging to the navy for publication in the PROCEEDINGS must be in duplicate, one copy being signed by the author, which will be submitted to the Navy Department when the original is published, as required by General Order No. 46, of May 20, 1921.

**Reprints of Articles** The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary

and Treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

Original photographs of objects and events which may be of interest to our readers are also desired, and members who have opportunities to obtain such photographs are requested to secure them for the Institute.

Whole Nos. 6, 7, 10, 13, 14, 15, 17, 144, 173, 215 and Notice 217 of the PROCEEDINGS are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 75 cents per copy.

ANNAPOLIS, Md., January, 1922.

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# PROFESSIONAL NOTES

PREPARED BY

LIEUT. COMMANDER R. A. HALL, U. S. Navy

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## FRANCE

FRENCH NAVAL OUTLOOK.—While France's powerful army is progressing silently, having not only numbers (769,000 men in 1922), but, what is of greater moment, a trusted war doctrine that has victoriously withstood the test of the real thing, France's navy is yet under a cloud, slowly recovering from the blows it sustained in the course of the war, viz., neglect of all new construction and relative decline of the matériel, and, what is much worse, loss of the pre-war *doctrine navale*, so patiently elaborated by AdmIs. Daveluy and Darrieus and other painstaking pupils of the eloquent Mahan, and which events showed to be no longer adapted to our times. From the stormy squabbles that are agitating naval circles and lending interest to every *réunion* of the *Conseil Supérieur* it is easy to gauge that where the *Marine Française* has suffered most is not in her matériel, but in her *morale*. Gallic naval men suffer from having been made to play a defensive rôle, to which their national temperament and training totally unsuited them. No doubt the war achievements of the French Navy are quite creditable. Only ignorant or prejudiced critics can deny that, yet, when our young officers think of Jutland, and especially of the British exploits at Dover and at Zeebrugge, they cannot help bitterly regretting that circumstances did not permit the gallant Adml. Rouyer and his cruiser squadron to make a desperate dash at the whole armada of the Kaiser and show what the descendants of Jean Bart and Duguay-Trouin could do against overwhelming odds. Inaction of systematic defensive is deadly to the naval spirit that can best thrive on traditions of offensive *à outrance* and self-sacrifice. In 1914 the French Navy had power, made up of the right stuff of seamen (think of the enthusiasm of the crews of the Rouyer and Guépratte squadrons), and the French Marine of to-day is suffering from the fact that that power was not used—at least, not used fully.

Here is the true cause of the "*malaise*" ashore and afloat, of the prevailing mistrust in those at the head and in their naval creeds and of the discouragement among young *officiers de vaisseau*, who complain of wasting their time and activity "*en travaillant dans le vide*," doing nothing or mere make-believe work.

Now, navies, to live and thrive, require a *raison d'être*, a clearly-defined object, or, as noted by Adml. Darrieus, "*une application à des cas concrets*."

For the present critics are so numerous and so noisy that the French naval outlook is apt to appear rather unpromising to those unacquainted with the past records and the recuperating possibilities of the Gallic naval service. On the morrow of the 1870 war the marine was pronounced by President Thiers to be useless, "*un luxe superflu*," just as it had been before condemned by Minister Louvois under Louis XIV: "*La marine coûte trop cher et ne sert qu'à défendre les côtes*." Still, high spirit was in 1885 displayed by the fleet under the able *Courbet* (China war). Again, under Ministers Pelletan and Thomson (1903-1909), the French Navy was thought to be dead or dying, in such a bad way, with untrained crews, defective guns, unreliable powder and ammunition, that Adml. Touchard then declared that his battle-squadrons were disarmed, unfit to fight, though they would know "how to die with honor." Yet five years later the situation had altogether changed, and a successor of Adml. Touchard, Adml. de Lapeyrère did not hesitate to assure his captains he had assembled after a successful battle-practice that he felt ready to tackle any comer (of course, in the old Nelson-Suffren style, barring new tricks).

The truth is that things are never so bad in the Gallic Navy as they appear to be. It is especially so now since the business-like Minister Guist'hau has put an end to the post-war stagnation, sent all battle-worthy ships to sea, and set the Section Technique hard working at superior ship and gun designs in conformity with his judicious and seamanlike motto: "*La marine est faite pour naviguer et se préparer activement au combat*." Action was the first need of the French Navy; it has revived it. The Salaun fleet, with modernized dreadnoughts, having full complements on board and a reserve of ammunition, must be proclaimed "*prête au combat*" (in pre-war style at least); and the Lequerré squadron of semi-dreadnoughts at Cherbourg will be in a satisfactory condition as soon as crews have been completed, minor repairs finished, and the practice of the sea resumed. No mean strides have thus been accomplished when it is remembered that last year there was hardly in the whole French Navy a single battleship fit to put to sea.

Senator Béranger, *Rapporteur du Budget de la Marine*, is reproaching Minister Guist'hau with having adopted an inadequate (*insuffisant*) naval program and with delaying the taking in hand of the same. The blame is not deserved, since M. Guist'hau is to be thanked for the voting of the cruiser program by the Chamber (a formality his predecessors could not succeed in performing), and since, also, the Commission de la Marine of the Chamber criticized the 8000-ton cruiser type as being unnecessarily large and costly, this in blissful ignorance of cruiser progress in other navies. As a matter of fact, it is a lucky thing for the French Navy the Briand Ministry weathered the recent Parliamentary tempest, as a governmental crisis would have further delayed shipbuilding. The Guist'hau program may not be much, but it is something, whereas if Ministers of Marine are to be changed every eight months nothing more than a nominal French fleet, without either worth or prestige, will be obtained, whatever expenditure is wasted in so-called Budgets de la Marine. Without stability and continuity of views at the head, no bona fide sea power is obtainable, and, with her peculiar system of mismanagement, the *République Française* is, year in and year out, wasting assets of strength and efficiency only second to those of Great Britain. Indeed, it is a strange spectacle for a great country to keep on "*jouer au marin*" in this expensive and fruitless

guise. No wonder many think with ex-Minister of War Lefèvre it would be more sensible once for all to recognize the incompatibility between the Republican instability and naval efficiency, and to shape accordingly the foreign policy of France.

With the Paris Parliament lies the responsibility for the French maritime decline. As noted by Député de Grandmaison, an efficient striking force on the water is not so much a matter of finances as of "*vouloir*" of will; and the Chamber is wholly absorbed by party quarrels and has no time to devote to sea affairs that are, moreover, completely ignored by the bulk of *Messieurs les Députés*. There has never been a *Budget de la Marine* which the Chamber has not curtailed and maimed. There has never been a naval program it has not delayed or reduced; and it is truly a marvel to think that under this "*règne de l'absurde*" the *Marine Française* has managed to live and is yet giving signs of a sturdy inward life. Under similar circumstances, especially when are reckoned the many disastrous consequences of instability in management, no other navy would have survived.

The Chamber and Senate will be asked this month to vote 965,000,000 francs for the Guist'hau program, of which 223 millions are to be expended in 1922, 344 millions in 1923, 327 millions in 1924, and 71 millions in 1925, in the construction of three 8000-ton cruisers of 35 knots, six 2400-ton and 36-knot scouts (probably three 140 mil. guns), 12 destroyers of 1200 tons, and 12 submarines of 1100 tons. In addition, credits will be asked for a "*program d'aéronautique*" that is ready and for a "*programme de défense des côtes*" prepared in collaboration with the war office, that contains interesting innovations.

The 1922 *Budget ordinaire* was to attain 939,948,000 francs (about 350 million in pre-war money), against 951 million francs in 1921. Unfortunately, the Minister of Finances, who (amusing to note) is a late President de la Ligue Maritime, has already made a reduction of 96 million francs in next year's Budget, and he wants still further "economies," for the good reason that France has in 1922 a projected expenditure superior by some two milliard francs to her normal income, as the consequences mostly of the German devastations and partly of the growth of "*fonctionnarisme*."

A strong demand is anew being made for a reduction in the number of arsenals. While Brest, Toulon, and Bizerta will be preserved as first-class *ports-militaires*, it is probable that Rochefort will be suppressed and Lorient and Cherbourg reduced to the rank of secondary bases and arsenals.—*Naval and Military Record*, 16 November, 1921.

PARIS DEPUTIES ADOPT LARGE NAVAL BUDGET.—The chamber of deputies to-day (6 December) adopted provisionally the naval budget of 844,000,000 francs, which covers the commencement of and progress on three light cruisers, six torpedo boat destroyers, twelve torpedo boats, twelve submarines and one airplane carrier; and later in addition three cruisers and 24 submarines.

It developed during the debate that annual construction probably would cost 333,000,000 francs, making future naval budgets average 1,200,000,000 francs. This would include 50,000,000 francs annually for submarines and coast defense.

Admiral Guepratte, describing France's fleet as almost nonexistent, said that five of the former German warships, despite the fact that they are antiquated, are France's best units.

It was remarked during the debate that the present naval appropriation was only 5 per cent of the total budget compared with 13 per cent in 1914. The present budget increases the naval personnel from 51,000 to 57,000.

France now has about 50 submarines, mostly small and many of them obsolete. The best of them are ten 800-ton boats surrendered by Germany. Admiral Guepratte and other deputies emphasized the importance of submarines to France and said experts during the past year had been seeking

to perfect plans for the most modern type of this kind of vessel.—*The Washington Post*, 7 December, 1921.

### GERMANY

**EX-ENEMY SHIPS.**—The Reparation Commission in Paris has issued an interesting statement as to the way in which Germany has fulfilled her obligations under Part VIII (Annex III.) of the Treaty of Versailles down to the 1st May, 1921. This relates to the obligation laid upon her by the victors in regard to the handing over of mercantile tonnage. From the statement it would appear that a total of 2,153,407 tons had been handed over. This fleet is made up of:

Passenger vessels .....	611,327 tons.
Cargo vessels .....	1,432,191 tons.
Sailing ships .....	80,140 tons.
Fishing boats .....	9,749 tons.

If one appreciates the wording of the statement properly, it would seem that this total does not include the many and important vessels which now fly the United States flag, but which were formerly comprised in the German Mercantile Marine. For the vessels with which the statement deals are vessels which have been *surrendered*. The vessels now under the American flag were never surrendered. They took refuge in United States ports on the outbreak of the war in August, 1914, and remained sheltering there till the United States itself became a belligerent. Then it promptly seized all the German tonnage within its jurisdiction. At the Armistice the Americans announced their intention of continuing to hold these ships. This it has done. As the United States were obviously not parties to the Treaty of Versailles it is further apparent that these vessels cannot be dealt with under its provisions. It seems obvious then that the American claim is based upon seizure and continued possession, and accordingly the real diminution of Germany's mercantile fleet is, say, 600,000 tons greater than the figures from Paris would lead us to imagine. An official estimate of the value of the tonnage surrendered is also furnished by the Commission. This is put at 745 millions of gold marks, which would be equivalent to thirty-seven and a quarter millions of British currency.

Not only are the German shipbuilding yards well occupied with work for the purpose of restoring their country to the place on the seas which had been won for it prior to the war, but temporary measures are being taken for showing the commercial flag while the new fleet is in process of making. Owing to the low standard to which the German paper mark has now fallen in the international exchanges, Germany can make a good thing out of running foreign ships which would otherwise be laid up owing to the fact that in consequence of the relatively high rate of their own country's exchange, they cannot be profitably employed under their national flag. Accordingly, many vessels are being sold, or colourably sold, by Swedes to German shipowners. Swedish vessels are being removed to the German register and being managed by German shipowners, who, in addition to certain allowances, receive 10 per cent of the net profit from the working of the ship as compensation for the work of management.—*The Marine Engineer and Naval Architect*, November, 1921.

**GERMAN SHIPPING TO THE FAR EAST.**—The latest extension of German shipping is a cargo service to the Far East. The Hamburg-America and the Norddeutscher Lloyd are arranging a united service which opens on December 4 with the H. A. L. motor ship *Haveland*. The N. D. L. steamer, *Westphalia*, follows on January 7, 1922. Vessels call at Bremen and Rotterdam, and then proceed to the Straits, Hong Kong, Shanghai, Kobe and Yokohama. The ships employed afford accommodation for a limited num-

ber of passengers.—*Engineering and Industrial Management*, 17 November, 1921.

**NORTH GERMAN LLOYD'S NEW OCEAN-GOING FLEET.**—In a statement issued to the German press, Vice-President Ehlers of the North German Lloyd Company states that his line is making rapid progress with the rehabilitation of its fleet. At present the company is employing in the Brazil service the *Vege sack* and *Bremerhaven* which were built last year and has recently repurchased from England its former steamers *Westfalen*, *Holstein*, *Gotha*, *Seydlitz*, *York*, *Göttingen* and *Hannover*. These steamers are of about 50,000 tons gross.

On October 1 there was launched for the company the steamer *Minden* of 4200 gross tons. She is 360 feet long and has accommodations for 12 cabin passengers. The *Minden* is a coal burner. In order to be able to compare the different motive powers now in use with regard to their safety and profitableness, the company has ordered two sister ships of equal size, one of which will be fitted with steam turbines and the other with Diesel motors. The largest unit building for the line is the steamer *Hindenburg* of 35,000 gross tons which is completing at the Schichau Yards in Danzig. She is a sister ship of the *Homeric* of the White Star Line.—*Nautical Gazette*, 19 November, 1921.

**DIRIGIBLE CONSTRUCTION IN SPAIN.**—An arrangement has been reached between the Compania Trans-Atlantic and the Zeppelin Company of Germany for the construction in Spain of two rigid airships, each 250 meters long, 38.8 meters in diameter, and with a gas capacity of 180,000 cubic meters.

An air base is to be established in Spain (between Sevilla and Cadiz) where one shed will be built. A base has also been selected in the Argentine Republic where two sheds—one revolving—will be erected. The manufacture of the sheds will require an estimated time of two years. The sheds themselves can be built in much less time.

A smaller ship of the capacity of 50,000 cubic meters will be used for service between Spain and the Canary Islands, and for the training of pilots.—*Aerial Age Weekly*, 28 November, 1921.

**GERMANY'S PAST AND FUTURE SHIP OUTPUT.**—In a review of the present position of shipbuilding in Germany, a correspondent of *The Shipbuilder* states that about 73,000 men were employed in German shipyards in 1913. The output that year was about 460,000 gross tons or an average of 6.3 tons per man. In 1919 there were 80,000 men engaged in the construction of merchant vessels, who produced 250,000 gross tons or just over three tons per head. Most of the ships built in that year were small units, requiring more labor per ton than vessels of large tonnage, but the diminution of output as compared with that of pre-war days is obvious. As regards 1920, the output of that year may be estimated at about 320,000 tons with 75,000 men employed or about 4.3 tons per man.

At the present time the cost of construction is about 8000 marks per gross ton, but this is likely to be advanced shortly owing to the increasing cost of material and labor. At a cost per ton of 8000 marks, the government indemnity funds awarded shipowners permit an output of 330,000 gross tons in 1921, 210,000 tons in 1922, 150,000 tons in 1923, 110,000 tons in 1924 and 50,000 tons in 1925. To these totals must be added any ships built for private shipowners apart from the government's program.

In some of the German shipbuilding establishments, the output of the men per head is now as great as it was before the war. At other plants, the output is still materially less, the falling off being as much as 25 to 30 per cent. Moreover, the output of the yards has been considerably cur-

tailed by the adoption of the 48-hour in place of the 57-hour week.—*Nautical Gazette*, 26 November, 1921.

### GREAT BRITAIN

**NEW WARSHIP CONTRACTS LET.**—The contracts for the four capital ships provided for in the naval program of Britain have now been placed by the Admiralty. The orders have been pretty fairly distributed, and the balance has been evenly held between the necessarily conflicting claims of the different steelmaking and shipbuilding districts and the facilities they can provide for the execution of such contracts. True, the Clyde receives orders for three of the new battle-cruisers to the Tyne's one, but the contracts for the armaments of the vessels will provide employment for thousands of men in Sheffield, Manchester, Barrow on the Tyne, and at Woolwich Arsenal.

**Names of Successful Bidders.**—The hull and machinery of one vessel, as everyone expected, go to Messrs. John Brown & Co., Ltd., of Clydebank and Sheffield. As the experienced builders of H. M. S. *Hood* and many another warship of recent design, high speed, and heavy armament they could not be passed by. The Fairfield Shipbuilding & Engineering Company, Ltd., of Govan, Glasgow, also receive an order for a complete ship, hull and machinery. Then Messrs. William Beardmore & Co., Ltd., have received the contract for the hull of the third battle-cruiser, but the machinery will be built by Messrs. Vickers. The successful Tyneside firm, Messrs. Swan, Hunter & Wigham Richardson, Ltd., has a reputation for merchant shipbuilding which is second to none, but in modern warship construction of the largest type it has yet to win its spurs.

The machinery of this ship has been sub-let to Messrs. Parson Marine Steam Turbine Company, Ltd., of Wallsend. The contracts will mean an expenditure in the Clyde center alone of possibly over £25,000,000, and employment for thousands of shipyard workers for the next three or four years. Each vessel, it may be roughly estimated, will cost about £9,000,000 to complete. At Sheffield, too, the steel contracts will provide work for many hands and "shops," and all round, the orders should give a much-needed fillip to employment in the iron and steel trades of the Kingdom. The designs of the new ships are, of course, secrets of the Admiralty, but naturally they will incorporate all the sea lessons of the war which our navy, above all others, should know best.—*Nautical Gazette*, 19 November, 1921.

**AMERICA'S GREAT LEAD.**—It would be paying the Americans a poor compliment to attribute their initiative in the matter of naval disarmament purely to altruism. Certain newspapers in this country, which appear to think that a never-ending stream of servile flattery is required to keep our American friends in good humor with us, are already uttering hysterical protests against any "tampering" with the Washington scheme of cutting down the navies of the world. This sort of behavior is decidedly un-British and by no means calculated to raise our prestige across the Atlantic. There are few papers, we venture to affirm, which have striven so consistently as *The Naval and Military Record* to foster amicable relations with the United States. Our efforts in this direction have frequently met with generous recognition from the American Service Press, and we shall therefore not be misunderstood if we try to throw a little fresh light on the genesis and true meaning of the naval proposals laid before the Conference by Mr. Hughes.

The fundamental motive is, without doubt, a sincere desire both to lighten the international burden of armaments and to avert war in the Pacific. It is, indeed, the transparent honesty of its authors which has caused the scheme to be so favorably received in practically every quarter. They offer no one-sided bargain, and demand of others no sacrifice which they are not

prepared to make themselves. It is a square deal in every sense of the word, with all the cards laid on the table—a refreshing contrast to the hole-and-corner methods, the chicanery, and the cynical sophistry which characterized the proceedings at The Hague. But when all this is admitted, the fact remains that the proposals for scaling down the battle fleets, suspending further dreadnought construction, and allotting definite standards of strength for auxiliary craft have been most carefully drafted with an eye to America's own strategical requirements of the future. This does not mean that the scheme is unfair to Great Britain or Japan. On the contrary, it is eminently fair, given certain minor readjustments which will doubtless be suggested by the technical experts who are considering the program.

The British Empire, with its intricate network of sea communications to guard, and its almost complete dependence on seaborne imports of food, may reasonably lay claim to a larger share of such vessels as are best suited to the work of patrolling the ocean highways. In our opinion the British Navy might be twice as strong as the American Navy in cruising ships, and yet have too few to protect the Empire's trade in wartime; and if the navy cannot fulfil that all-important function, it is demonstrably inadequate. Japan, on her part, is raising some objection to the wholesale scrapping of costly warships which are within measurable distance of completion. She wishes to proceed with the *Mutsu*, a 33,800-ton battleship armed with 16-inch guns, which is due to hoist the pennant next month, and is very loath to break up the still larger battleships *Kaga* and *Tosa* and the giant battle-cruisers *Amagi* and *Akagi*, several of which have reached the launching stage and would probably have been afloat by now but for the labor troubles in Japan. It is further pointed out by Japanese critics that the suggested ratio of scrapping would bear more heavily on their country than others. America undertakes to delete 15 vessels out of a total of 33, which is equivalent to 46 per cent, while inviting Japan to discard ten ships out of 20, which means a 50 per cent reduction.

There is even more force in the Japanese argument that her inferior resources for shipbuilding and armament production ought to be taken into account when determining the strength of her permanent fleet. Both Britain and America could add enormously to their naval establishments in the course of a year or two of intensive building, as, in fact, both did during the war; but this would be impossible for Japan. Finally, there is considerable misgiving in Japan as to the effect that a sudden and complete suspension of all naval construction may have on the labor and general political situation, which is none too stable at the moment. Four-fifths of the entire work at present being done in Japanese shipyards is on behalf of the navy, and, if this were withdrawn, the shipbuilding industry would be threatened with ruin. Common justice demands that consideration be paid to the peculiar difficulties which confront Japan in this matter of naval reduction.

No feature of the scheme propounded at Washington has evoked more comment than America's offer to scrap her six battle-cruisers. Nearly every American naval critic has hitherto referred to these ships as being absolutely indispensable, and, although there had been plenty of suggestions for discontinuing work on the six heaviest battleships, it was taken for granted that the battle-cruisers would have to be completed at all costs. What is the explanation of this surprising change in the American attitude? Principally, we think, a desire to give concrete proof of good faith, and a frank recognition that the sacrifice of the battle-cruiser program was a condition precedent of a true "naval holiday."

Had these six ships been retained, Japan would unquestionably have gone on with her four corresponding vessels of the *Amagi* class, and we should probably have decided to complete the four super-*Hoods*. Realizing this, America has taken the bull by the horns and offered to demolish six ships

which would have been the most powerful and valuable units of her future battle fleet. But there was perhaps a third reason for the sacrifice, namely, a growing doubt as to the wisdom of building such huge, costly, and vulnerable vessels at a time when aircraft and submarines are developing remarkable powers of offense.—*Naval and Military Record*, 23 November, 1921.

**BUILDING SUSPENDED.**—There is a prospect of the fruits of the Washington Conference being garnered at an earlier date than had been anticipated even by the most sanguine optimist. In less than a week of the assembly of the nation's delegates in the capital of the United States, the British Admiralty feel justified in issuing instructions for the suspension of work on the four super-*Hoods*, for which orders were given last month at an estimated cost of £30,000,000. The general public have every reason to rejoice over this fact, but by the many thousands of people interested in the shipbuilding industry the announcement will be received with mixed feelings; and, although the orders for the ships had been allotted to private yards in the North, the employés in the Royal Yards are directly interested in view of the probability of further discharges from the national yards in the near future. How seriously the suspension of the work will affect the shipbuilding industry and kindred trades is indicated by the fact that at the beginning of this month the statement was officially made that it was considered that some 5000 men would be employed in the shipyards, engine works, and steel works during the last two months of this year, and that in the New Year this number would rapidly increase to 25,000 men. The number of firms that would be interested to a greater or less extent in actual building or in providing material would probably be in the neighborhood of 500.—*Naval and Military Record*, 23 November, 1921.

**"DURBAN" COMMISSIONED.**—The *Durban*, which hoisted the pennant at Devonport on 1st inst. for service with the Fifth Cruiser Squadron on the China Station, where she will be on service by the time the Prince of Wales arrives in the Far East, is the second light cruiser to be completed at Devonport since the Armistice. She was laid down at Messrs. Scott's Shipbuilding and Engineering Works at Greenock as long ago as January, 1918, so that three years and nine months have been occupied in building a class of ship which before the war, to take the case of the Devonport-built *Aurora*, was completed in a little short of two years.

The *Durban* was brought from Greenock to Devonport to be finished in order to give work to the Westcountry establishment, but was not given much attention by the dockyard authorities until the *Raleigh*, a larger and more powerful light cruiser, which also came from a private shipyard on the Clyde to be completed, was placed in commission. According to the current year's estimates, the total cost of the ship is £861,602, excluding armaments and ordnance stores.—*Naval and Military Record*, 9 November, 1921.

**THE BURDEN OF ARMAMENTS.**—Some very instructive figures relating to the pre-war and present ratios of military expenditure to the total national disbursements have been brought to our notice. In the financial year 1913-14 the appropriation for the navy was 24 per cent, and that for the army 14 per cent of the total expenditure. In the following year the percentage for the army remained constant, but the navy budget rose to 25 per cent. When these figures are compared with the budgets for 1921-22 it will be found, not only that a very large reduction has taken place in military expenditure as a whole, but that the army has now usurped the navy's former place as the most expensive fighting service; for the current army estimates represent 10 per cent of the total expenditure, and the navy estimates only 8 per cent. Eight years ago there were 149,960 officers and men on the navy's pay-roll, and the total personnel vote was £12,227,702. The number borne to-day is 123,700, a reduction of 17 per cent, yet the per-



sonnel vote has risen to £28,350,600, an increase of 132 per cent. In spite of the substantial cut in numbers, the pay-roll is 122 per cent heavier than in 1913, and the vote for victuals and clothing has increased by 157 per cent. The cost per man in 1913-14 was £81 10s. 9d.; to-day it is £229 3s. 9d.—an increase of 181 per cent. Extending the comparison to the shipbuilding programs, we find that the new program authorized in 1913-14 called for five battleships, eight light cruisers, sixteen destroyers, and a number of submarines and auxiliaries; whereas the new program for 1921-22 provides for only four capital ships to replace those becoming obsolete.

Turning to the army statistics, a somewhat different picture appears. The strength in 1913-14 was 180,000, and the personnel vote amounted to £24,214,000. At the present time the army has a strength of 341,000, and the personnel vote is £84,161,000. Thus, although there has been an increase in strength of only 89 per cent, the charge for maintenance, pay, etc., has risen by 196 per cent. An arresting item in the army estimates is that which concerns the expense of the War Office and Staff of Commands, etc. Eight years ago this vote was limited to £443,000; to-day it is £4,149,900—an increase of 836 per cent. Studied as a whole the statistics reveal very clearly the enormous cost of maintaining even comparatively moderate armaments under present-day conditions. Twenty shillings spent to-day produce about the same degree of naval or military power that was purchasable in 1913 for eight shillings. The fact that we are now spending more on the army than on the navy is due to a variety of causes which are fairly well known, chief among them being the heavy military commitments left over by the war.—*Naval and Military Record*, 9 November, 1921.

DOCKING OF H. M. S. "HOOD."—An old but interesting problem has come up in connection with the docking of H. M. S. *Hood*. It is understood that as the result of firing trials the plating of the ship has been strained, and it will be necessary for the newest British warship to be repaired as well as re-fitted. The straining of warship structures as a result of the firing of heavy guns came up for serious consideration during the war period, and it is one with which naval architects are quite familiar.—*The Engineer*, 11 November, 1921.

BRITAIN'S OIL POLICY.—A singularly clear and candid exposition of the oil question and its bearing on our relations with the United States was printed lately by *The Times*. It is safe to say that very few members of the public realize how closely this question will affect the outcome of the Washington Conference. Most of us regard the controversy over the ownership or control of the various oilfields as a mere business squabble between rival plutocrats, but in reality it is of far wider significance. The well-informed writer in *The Times* does not hesitate to assert that a complete understanding between America and ourselves on the international aspect of oil production and supply must precede any agreement as to the limitation of armaments. "Indeed," he adds, "it may fairly be advanced that if Great Britain is not prepared to make concessions in this vital question the Conference is likely to break down."

The present position seems to be that the British Government, acting on the urgent representations of the Admiralty, has lent the weight of its influence to bring large tracts of oil-producing territory under the control of syndicates in which British capital predominates. This policy has roused the antagonism of the Standard Oil Company, probably the largest and most influential business combine in the world. Now the Standard Oil people can pull many strings, even at Washington, as we have discovered from the official notes addressed to the British and Dutch governments. They are assiduously fostering the belief that this country is out to corner the world's entire oil resources, and the patent absurdity of the charge has not prevented it from being widely accepted. German and Irish mischief-makers

in the United States are using it as the text of fresh diatribes against perfidious Albion, and the Hearst papers have seized with avidity upon this new pretext for sowing discord between the two countries.—*Naval and Military Record*, 16 November, 1921.

**MANNING AND TRAINING PROBLEMS.**—So drastic has been the reduction in the personnel of the Royal Navy since the end of the war that the Admiralty are experiencing difficulty in putting into operation in its entirety the new scheme for the training of boys in sea-going ships. The shortage exists not only in the number of schoolmasters available for service afloat, but in the number of petty officers for duty as instructors. It is probable that as the result of the encouragement offered to seamen to qualify for promotion there will in the near future be sufficient petty officers to meet the needs of the fleet.

Whether the schoolmasters' branch will reach the required strength will mainly depend upon the promised concessions in rates of pay and conditions of service which have been promised, but it is evident that these improvements have been decided on none too soon. In the meantime several paragraphs in the scheme promulgated in 1919 are to remain in force and will continue to operate until the necessary number of schoolmasters is available, while with regard to petty officers, the Admiralty directs that until such time as the necessary number is available it shall be left to each commanding officer to decide at his discretion whether the new scheme shall be introduced in its entirety.—*Naval and Military Record*, 9 November, 1921.

**TEMPORARY NAVAL OFFICERS.**—It is satisfactory to learn from a recent reply to a question in the House of Commons that no temporary officers for combatant duties remain in the Naval Service. There are, of course, a few officers entered on a temporary basis during the war who are not yet demobilized, but in each case there are special and exceptional circumstances which govern their retention. In one category are the officers entered in consequence of a shortage of permanent officers in the medical, dental, and instructor branches, and the whole-time Roman Catholic and Nonconformist chaplains who were formerly employed on a civilian basis. Another category consists of the officers employed with the Inter-Allied Commission of Control in Germany, mainly on interpreting duties, and those employed as interpreters in the Eastern Mediterranean, where there are also a few officers retained on account of their special knowledge of local conditions. Most of the latter, however, will be demobilized shortly or relieved by officers of the Royal Navy. It cannot be too strongly impressed upon the authorities that in view of the great reductions in the fleets and naval establishments—which may be extended somewhat as a result of the Conference now taking place in Washington—and the consequent increase in the numbers of regular officers who are obliged to go on half-pay, often with great hardship to them and their families, every possible check should be placed upon the keeping on of temporary officers, many of whose jobs could, at least, after a short period of study, be taken over by officers of the Royal Navy.—*Army and Navy Gazette*, 19 November, 1921.

**THE FLEET AND AIR OBSERVERS.**—Upon similar lines to the specialist branches for gunnery, torpedo, navigation and signals, the British Admiralty have decided to make a specialist branch of the Air Observers among naval officers. For the present, eight officers will be selected each half-year. In time, only junior lieutenants of two years and upwards will be selected, as in other specialist branches, but a few commanders and lieutenant-commanders are required, immediately for training. Courses, each of seven months' duration, will begin in May and November in each year, and will include two months' preliminary training at the naval schools in gunnery and signals, and five months at the seaplane training school at Lee-on-Solent.

While under training with the R. A. F. officers will receive the full pay of their naval rank, with extra remuneration for each actual day of ascent, of 3s. in the case of commissioned and subordinate officers, and 1s., 6d. in the case of warrant officers. After qualifying they will be eligible for appointment as observers in aircraft carriers in the Royal Navy, and while actually detailed as trained observers will receive allowances of 4s. and 2s. a day respectively. If qualified in wireless telegraphy, these allowances will be increased to 6s. and 3s. a day. Officers will retain their naval rank and wear naval uniform while under training. On completing the qualifying course they will be rated probationary observers and appointed to fleet carriers for further training. On completing six months, including a course at Leuchars, Fife, they will be eligible for confirmation on the recommendation of the commander-in-chief of the Atlantic fleet.—*Aerial Age Weekly*, 5 December, 1921.

**ADMIRALTY AND REQUESTS FOR CHANGES.**—As applications are frequently made to the Admiralty to have appointments cancelled, it must be pointed out that officers cannot, as a general rule, be permitted to select or decline appointments. Applications to have an appointment cancelled are not to be made except for urgent reasons, which are to be fully stated in writing. If an officer making such an application is on full pay, his commanding officer, in forwarding it, is to state whether or not he recommends that the application shall be granted. This does not apply to officers on unemployed pay.

Many officers as a matter of principle never decline an appointment at whatever personal or private inconvenience. It is evidently unfair to such officers if others are permitted to do so with the object of avoiding foreign service appointments of an arduous character, etc.

Applications are also received for appointments to particular ships. The board consider that such application for exchange may be forwarded for consideration through the usual channels provided that adequate reasons are given, and that the commanding officers of both ships concerned express their approval of the application.—*Naval and Military Record*, 23 November, 1921.

**FLEET COAL SUPPLY.**—The Admiralty has invited tenders for the supplies of Welsh coal during 1922. The Admiralty pre-war requirements amounted to about 1,500,000 tons per annum. The requirements for next year are anticipated to be only about one-third that figure, by reason of the development in the use of oil in the navy.—*Engineering*, 18 November, 1921.

**IMPERIAL WIRELESS.**—With regard to the proposals for the imperial wireless chain, the postmaster-general has stated that the scheme was approved by the government and was endorsed by a committee of the Imperial Conference over which Mr. Churchill presided, and by the conference itself in the following resolution: "It is agreed that His Majesty's government should take steps for the erection of the remaining stations for which they are responsible, as soon as the stations are designed; that the governments of Australia, the Union of South Africa and India, should take similar action so far as necessary, and that the governments of Canada and New Zealand should also co-operate." The above scheme was accepted by the Prime Minister of the Commonwealth subject to giving full freedom of action to Australia to decide the method in which Australia will co-operate. No change in the policy of the government has since taken place. The first two stations in the imperial chain, Leafeld and Cairo, will be completed and working by the end of this year, and a commission of experts has been engaged in designing the remaining stations. Their report is expected within a few weeks, and on its receipt the construction of the stations will be proceeded with as quickly as possible.—*Engineering*, 25 November, 1921.

**FIRST 20,000-TON LINER WITH DIESEL ENGINES.**—The first 20,000-ton motorship will be the new British trade ship, which is being built for exhibition purposes. She is to make an 18 months' tour of the world and is to sail on her first voyage in August, 1923.

According to *Motorship*, three Diesel engines each of 3000 horsepower are to be installed on this trading craft. Through the use of internal combustion motors in place of steam, extra space will be available for exhibits and cabin accommodations. No funnel will be required and coaling will be entirely done away with. Moreover, the propelling machinery will represent the very latest development in marine engineering and will be certain to prove of great interest to visitors at the overseas ports at which the ship is to call.—*Nautical Gazette*, 26 November, 1921.

**BRITISH SHIPPING FIRST IN CHINESE TRADE.**—For the first time since 1914 statistics of the tonnage entered and cleared from Chinese ports have been published. The total figures were 104,266,695 tons, of which 40,300,000 tons were British, 28,200,000 tons Japanese, 23,600,000 tons Chinese and 4,700,000 tons American. In 1919 the American total was only 2,100,000 tons.—*Nautical Gazette*, 19 November, 1921.

## JAPAN

**JAPANESE NAVAL CONSTRUCTION.**—The fact that Japan as a naval power is now inferior only to ourselves and the United States forms the subject of a great deal of comment both here and across the Atlantic. It has drawn unusual attention to the financial and political aspects of Japanese naval policy, and was undoubtedly one of the main reasons why the American Government convoked the present Conference. At first sight there seems little enough justification for this sudden interest, not to say apprehension, regarding the naval developments which have been taking place in the Far East. Reckoning only such ships as are now in service, the Japanese Navy does not appear to be particularly formidable in comparison with the navies of Great Britain and the United States. Its elevation to the rank it occupies to-day is due much more to fortuitous circumstances than to any efforts put forward by the Japanese themselves. Had not the war intervened, Japan might still be fourth, perhaps even fifth, in order of naval precedence, for her existing fleet is considerably smaller than that which Germany possessed at the outbreak of hostilities. Moreover, the program that France had in hand in 1914 would doubtless have been completed in the normal course of events, in which case the French Navy would now be stronger in battleships than the Japanese. The really significant factor in the situation is not the amount of naval tonnage which Japan has already built, but the amount which she has on order or proposes to build. This is so large that its completion would approximately double her present fighting strength at sea. On October 1 of the current year, the Japanese Navy included only seven completed dreadnought battleships and four battle-cruisers. The corresponding figures were, for the United States, 20 battleships and for Great Britain, 22 battleships and seven battle-cruisers. Therefore against a total of 20 American or 29 British all-big-gun ships, Japan could muster only 11. Had there been no reason to anticipate any drastic alteration in this ratio, the present discussion with regard to Japanese naval policy would be irrelevant and uncalled-for. It is only when we turn to the statistics of tonnage building or authorized that we begin to appreciate the magnitude of Japan's naval preparations. Her avowed purpose—now presumably to be modified—was to create a first-line fleet of two squadrons, one comprising eight battleships and the other eight battle-cruisers—or 16 capital ships in all. Of the vessels already completed, only two were deemed worthy of inclusion in this so-called "eight-eight fleet"; which means that the remaining 14 units have yet to be completed. It will, therefore, be seen that the 11 capital

ships now in commission represent numerically less than half the establishment contemplated, which would ultimately have stood at 25 ships, 16 of which were to be of the largest and most powerful type. The date on which this maximum degree of strength was to be attained was March, 1928. Besides the capital ships enumerated, provision had been made for 12 cruisers, 32 destroyers, 5 gunboats, 18 fleet auxiliaries, and "a certain number" of submarines—all of which were additional to construction voted previous to July, 1920. According to an Admiralty statement in the House of Commons on December 1, 1920, Japan had on hand at that time the balance of an old program due for completion in 1923-24, the residue of which included 11 cruisers and 41 destroyers.

We are not concerned with the political aspect of this great shipbuilding scheme, but some brief comments on the financial burden its execution would have entailed may not be out of place. The following table\* shows the credits which have been or were to be voted year by year for new construction alone, as distinct from other naval services, during the period covered by the program now in force:

1920-21 .....	£23,189,233
1921-22 .....	27,330,135
1922-23 .....	20,092,565
1923-24 .....	15,473,463
1924-25 .....	10,081,144
1925-26 .....	11,205,479
1926-27 .....	11,369,285
1927-28 .....	11,537,735

This gives a total of £131,179,039 to be spent on new naval tonnage in the space of eight years. It is an imposing sum as it stands, the expenditure of which would strain the resources of a state much wealthier than Japan. Nevertheless, it is already evident that if the program had been carried out in its entirety the above estimate would have had to be revised on the upward scale. It was framed last year on the supposition that the cost of each ship would not exceed a certain figure, but it is notoriously difficult to forecast the trend of naval design even a few years ahead, and what seems an ideal type to-day may have become almost obsolete by to-morrow. The present cost of a capital ship of conventional type is probably about £7,500,000 or £8,000,000. But should anything occur to make still greater dimensions necessary or desirable, the cost per ship must inevitably rise in proportion. There is, indeed, some reason to believe that improvements made recently in the design of certain Japanese ships which were about to be laid down have upset the financial calculations on which the above table was based, and the Press of Japan takes it for granted that the building program would eventually have cost from 20 to 30 per cent more than the original estimate. The difficulty of appraising the annual cost of a given program of naval construction over a long term of years has often been exemplified. Germany, in carrying out her "Flottengesetze," found it impossible to adhere to the yearly instalments originally fixed, and more recently still the United States have been compelled to make a substantial increase in the credits authorized for each and every type of ship included in the three-year Navy Law of 1916.

One striking point about the Japanese naval budget is the extraordinarily large percentage which is absorbed by new construction. This vote alone accounts for 55 per cent of the total navy appropriations in the current year. An analysis of Japan's national income and expenditure shows that this year's vote for new naval construction is equivalent to 17.5 per cent of the total revenue from taxation. Clearly therefore, "the burden of armaments" is something more than a phrase to the taxpayers of Japan:

\*The figures given were courteously furnished by the Imperial Navy Department, Tokyo.

That so large a share of the navy budget should be available for shipbuilding is due in part to the low cost of other branches of the service compared with foreign navies. Pay, pensions, allowances, victualling, labor charges, etc., are on a considerably lower scale than those prevailing in Europe or the United States. On the other hand, Japan probably has to pay more for building materials, machinery, armor, ordnance, and equipment, so that it is doubtful whether in the long run she gets better value for her naval expenditure than other powers.

Apart from the severe financial strain imposed by the "eight-eight" program, doubts have been cast upon the ability of Japanese industry to cope with so much naval work and complete it within the specified period. To do this would have necessitated an increase of approximately 50 per cent in the present rate of output from the shipyards, engineering shops, armor and ordnance factories. When introducing the new program to the Imperial Diet in July, 1920, the Minister of Marine said that the national building capacity was two capital ships a year. But if the whole of the fourteen new capital ships were to be in service by 1927 it is obvious that production would have had to be accelerated. Long before the Washington Conference met, certain organs of the Japanese Press said openly that the program could not be completed to time-table without enlisting the aid of foreign builders, and it is no secret that inquiries have been made in this country by the Japanese authorities with a view to placing orders for warships. That no such contracts have actually been awarded is attributed to dissatisfaction with the terms quoted. Be that as it may, British industry has already been called upon to supply machinery, armor plate, and ordnance accessories for certain Japanese vessels now under construction. There is a natural reluctance in Japan to let more work go out of the country than is absolutely necessary, especially at a time like the present, when the shipbuilding and kindred industries have been badly hit by the slump in mercantile tonnage. Precise details of the shipbuilding resources now available in Japan are not easy to obtain. It is known, of course, that the government yards at Kure and Yokosuka and the private establishments of Mitsubishi and Kawasaki can undertake "dreadnought" construction, and have, in fact, built capital ships of the largest dimensions. Other private yards, however, may now be in a position to accept such work, thanks to the extensions that were made during the war period. Five such establishments were in process of developing their building facilities on a very large scale when the war came to an end, but it is not certain whether their plans have materialized. If they have it is probable that some, at least, of these yards could now build warships of any displacement. But the building of the hull is only part of the sum of labor represented by the completion of a great fighting ship, and while several of the yards in question may be competent to do this share of the work, it may be doubted whether they would be able to manufacture propelling machinery of such high power as that which is to be installed in the new ships—the battle-cruiser *Amagi*, for instance, is credited with engines of 170,000 shaft horsepower. Nor is it certain that the armor and ordnance plants, in spite of recent developments, could produce sufficient guns and armor plate to equip, say, four capital ships every year. A careful survey of Japanese resources in the light of the latest data obtainable leads the writer to estimate the maximum output of capital ships, complete in every detail, at three ships per annum. As regards smaller naval vessels, there are seven yards which can build and engine cruisers up to 8000 tons. The production of surface torpedo craft could undoubtedly be increased far beyond the present figure if it were deemed necessary to do so. Some noteworthy records in the rapid construction of these craft stand to the credit of Japanese builders, and a group of destroyers which had been completed in a few months went afterwards to the Mediterranean, where the vessels proved equal in every way to the arduous conditions of war service.

It is only during the past six years that Japanese naval opinion has become really impressed with the possibilities of submarine warfare. Since 1915, however, the submarine flotilla has been steadily reinforced, though the process was and still is attended with serious difficulties of a technical character. It was found that the European and American types from which the earlier boats were modelled were not well adapted to the peculiar conditions that govern submarine navigation in Far Eastern waters. Scantlings of abnormal strength are said to be essential in boats intended to operate in those latitudes. A purely Japanese design has been evolved, but reports as to its performance are somewhat conflicting. In particular, trouble is reported to have been experienced with the motors of native construction, and in recent years the tendency has been to rely very largely on foreign manufacturers for submarine engines. As is well known, Vickers, Limited, are now completing an order for several sets of submarine engines to Japanese account; and in August last it was announced that Messrs. Sulzer Bros., of Winterthur, had received a Japanese contract to the value of £1,250,000 for submarine Diesel engines in sets of 4000 brake horsepower each. From all accounts the program of July, 1920, provided for an eventual establishment of eighty "first-line" submarines, ocean-going and coastal types, very few of which have been completed to date. It remains to be seen whether the residue of this program which survives the reductions to be determined at the Washington Conference can be realized without enlisting foreign aid to a much larger extent than is the case at present.

Before leaving the subject of Japan's naval shipbuilding resources it will be well to correct a misapprehension which seems to be prevalent even in naval circles in this country, viz., that the industry in Japan is immune from the labor troubles which impose so serious a handicap on our own efforts in the same direction. Only a few weeks since one of the London newspapers printed an article by a British naval officer, who declared, *inter alia*, that "Japanese shipyard workers never strike." The accuracy of this statement may be judged by the fact that throughout last July and August the two greatest private shipbuilding yards in Japan, the Mitsubishi and the Kawasaki, were forced to remain idle in consequence of a strike involving no less than 40,000 workmen at Kobe alone, 90 per cent of whom were engaged in shipbuilding trades. Further enlightenment on this subject is given by the following extract from a Japanese paper of September 22: "Investigations published by the Furukawa Gomei Kaisha show that uncertainty of employment still continued to prevail during August, and disputes have multiplied since the second half of the year, owing to the spread of labor doctrines, the workers claiming the rights of collective bargaining, the adoption of a factory committee system, etc. During August there were fewer troubles than in the previous month. The number of disputes totalled twenty-five, in which 39,991 laborers were involved. These figures show, as compared with July, a decrease of fourteen in the number of disputes and 6000 of laborers affected. Classifying by industry, the shipbuilding trade suffered most severely, embracing 63 per cent of all the agitations." It will be seen, therefore, that the supposed Japanese advantage in respect of immunity from labor troubles in the shipbuilding world is quite illusory.

At the present moment there are four capital ships on the stocks in Japan. The Kawasaki Yard, Kobe, is building the battleship *Kaga*, and the Mitsubishi Yard, Nagasaki, the battleship *Tosa*. These are sister ships and were due to take the water in October. Their launch, which has been delayed by the strikes mentioned above, is expected to take place this month—November. According to press reports, their dimensions are: Length, 700 feet; breadth, 100 feet; displacement, 40,600 tons. Their speed is to be 23 or 23½ knots, and they will mount eight or more 16-inch guns. The other two ships being built are the battle-cruisers *Amagi* and *Akagi*.

laid down respectively at the naval arsenals of Yokosuka and Kure in December, 1920, and January, 1921. Both were to have been launched early next year. Their unofficial details are: Length over all, 880 feet; breadth, 103 feet; displacement, 43,500 tons; speed, 33 knots; main armament, eight 16-inch guns. As soon as the slips now occupied by the *Kaga* and the *Tosa* became vacant the keels of two new battle-cruisers, the *Atago* and the *Takao*, were to have been laid thereon. These vessels, which may never be built, are generally described as sisters of the *Amagi*, but they were just as likely to have proved larger and more powerful in every way. The launch early in 1922 of the *Amagi* and *Akagi* would have left the slips at Yokosuka and Kure free for the laying down of the new battleships *Owari* and *Kii*, regarding which no details can be obtained.

We come now to the completed ships of the Japanese Navy. The *Nagato* is not only the largest fighting ship so far built for the Japanese Navy; she is actually the largest battleship in the world at the present time, and now that the American ships of the *Indiana* class are apparently to be scrapped she will probably retain that distinction for a good many years to come. Her sister ship, the *Mutsu*, was completed this month and is now finishing off her trials. The *Nagato* was begun at Kure Dockyard in August, 1917, and did not reach the launching stage till November, 1919. She was formally commissioned in December, 1920, as flagship of the First Fleet, and now flies the flag of Admiral Tochinai. In general features she conforms to what has become the standard type of capital ship, characterized by a main armament of eight heavy guns mounted on the center line—the type which originated with the British *Queen Elizabeth* and *Royal Sovereign* classes, and is now represented in the American Navy by the *Maryland*. The dimensions of the *Nagato* are as follows: Length between perpendiculars, 660 feet 7 inches; breadth, 95 feet; mean draft, 30 feet; normal displacement, 33,800 tons. She is fitted with turbines with reduction gear, developing 48,000 shaft horsepower. The designed speed of 23½ knots was attained with ease on the steam trials. Very heavy armor and special underwater protection has been worked into this ship, but details as to the thickness of plating, etc., are carefully guarded. Such views and drawings as have appeared do not indicate the presence of a bulge. Eight 16-inch 45-caliber guns constitute the main armament. The 16-inch gun discharges a projectile of 2190 pounds with a muzzle velocity of 2800 foot-seconds, and the nominal figure of penetration at a range of 12,000 yards is 12 inches of hardened steel. The first Japanese gun of this caliber was built at the Muroran steel works, the breech mechanism being made at Kure arsenal. It is said to have proved a most successful weapon. The adoption of 16-inch guns by the Japanese Navy was due to the initiative of Admiral Baron Kato, the present Minister of Marine—now representing his country at the Washington Conference—who is strongly in favor of big calibers. It is interesting to note that a full broadside from the main battery of the *Nagato* would weigh 17,520 pounds, the corresponding figures for the *Maryland* being 16,800 pounds and for the *Queen Elizabeth* or the *Hood* 15,360 pounds. The *Nagato* thus fires the heaviest broadside of any warship completed up to the present date. She carries in addition twenty 5.5-inch 82-pounder quick-firing guns, mounted in casemates on the upper and fore-castle decks; three or four anti-aircraft guns, and eight torpedo tubes, some of the latter being, it is said, placed above the water line. Externally, the most arresting feature of this magnificent battleship is her foremast, which consists of a central trunk of large diameter supported by six struts. An electric lift working within the main trunk affords rapid access to the fire control station at the masthead. This heptapodal structure was built as the result of experiments which were made to ascertain the form of mast that would give the greatest rigidity and also offer the strongest resistance to shell attack.



The battleship *Ise* and her sister ship, *Huiga*, belong to the 1914 program, both being laid down in May of the following year. They are comparable in fighting power with their American contemporaries of the *New Mexico* class. The leading dimensions are: Length between perpendiculars, 640 feet; breadth, 94 feet; extreme draft, 28 feet 4 inches; normal displacement, 31,260 tons. Turbine machinery of 45,000 shaft horsepower is installed, the designed speed being 23 knots. The water line, the main artillery positions, and other vital parts are protected by armor 12 inches thick, but the armor decks appear to be less substantial than is now deemed desirable in modern capital ships. As these vessels were not begun till nearly ten months after the outbreak of war, it is to be assumed that special attention was paid to their defence against under-water attack. The main armament comprises twelve 14-inch, 45-caliber guns paired in turrets on the center line, two being placed forward, two amidships, and two at the stern. Twenty 5.5-inch quick-firing guns are mounted, mostly in upper-deck casemates, and there are four anti-aircraft guns and six submerged torpedo tubes. These vessels are slightly improved versions of the *Fuso* and *Yamashiro*, which were laid down respectively in 1912 and 1913, and the dimensions are very similar, except that the *Fuso* and her sister are 10 feet shorter and displace only 30,600 tons. Moreover, the speed is only 22 or 22.5 knots. The main armament is the same, but the amidship turrets are disposed on a different system. The armor protection is practically identical with that of the *Ise*.

Although she belongs to a type which is already obsolescent, the battleship *Settsu* is of interest as representing the first purely Japanese conception of an all-big-gun capital ship. Her keel was laid at Kure Dockyard in April, 1909, and she came into service some three years later. She is 533 feet in length over all, 84 feet 2 inches in breadth, and displaces 21,420 tons. Curtis turbines of 25,000 shaft horsepower give her a speed of 20.5 knots. Good protection is afforded to the vital parts by 11-inch and 12-inch armor and several strong decks. The main armament is twelve 12-inch guns, those in the forward and after turrets being 50 calibers long, while the remaining eight are 45 calibers in length. The disposition of the turrets is such that only eight guns will bear on either beam, and thus the full benefit of the powerful armament is not obtained. Originally there was a sister ship, the *Kawachi*, but she was completely destroyed in July, 1918, by an internal explosion.

In proportion to its strength in armored ships the Japanese Navy is well supplied with light cruisers. Two of those authorized under the current program are to be ships of more than 7000 tons. Other light cruisers being built or completed are the *Yura*, *Isudzu*, *Nagara*, *Natori*, and *Kiso*, while four ships of the same general type—*Kuma*, *Tama*, *Oh-i*, and *Kitakami*—have been completed during the past twelve months. All the vessels named are practically uniform in dimensions, displacing from 5500 to 5780 tons, with a speed of 33 to 33.5 knots, and an armament of seven 5.5-inch guns. It is believed that they burn oil fuel only, a system which has not yet been extended to the heavier vessels of the Japanese Navy, owing to the difficulty of securing a supply of this fuel adequate for all emergencies. The *Tatsuta* and *Tenryu*, completed during 1919, have many features in common with the British *Arethusa* class, to which, perhaps, they owed their design. They are 400 feet in length, with a beam of 40 feet 9 inches, and displace 3500 tons. Their speed is 31 knots, and they were the first large Japanese vessels of war to burn oil only. A light armament of four 5.5-inch guns is carried, together with six torpedo tubes on triple-deck carriages. The *Hirado* and her sisters, *Yahagi* and *Chikuma*, were laid down in 1910. In their case a not unsuccessful attempt was made to combine good speed, an extensive radius of action, and a powerful armament on a displacement of 4950 tons. The principal details are as follows: Length over all, 475 feet; breadth, 46 feet 6 inches; machinery, turbines of 22,500 shaft horsepower

for a maximum speed of 26 knots—exceeded on trial; armament, eight 6-inch 50-caliber guns and three torpedo tubes. All three ships performed splendid service in the Great War, steaming many thousands of miles without experiencing any engine-room troubles.

Japanese destroyers are of two types—first-class boats, *i. e.*, above 1000 tons, and second-class boats, *i. e.*, below 1000 tons. It has been customary for some time past to provide for both types in every annual program. The latest first-class boats approximate in size and armament to our flotilla leaders. They displace from 1300 to 1400 tons, have a designed speed of 34 knots, and mount three or four 4.7-inch guns, with six 21-inch torpedo tubes. To this group belong the seven vessels of the *Minekaze* class, and also the *Tanikaze* and *Kawakaze*. The *Amatsukaze* and her three sisters, launched in 1916, were the first of the really modern type of first-class destroyers. They displace 1227 tons, and have touched 35 knots in service. The armament consists of four 4.7-inch guns and six 18-inch torpedo tubes. The *Momo* class—ten boats in all—may be taken as typical of the new second-class type: Displacement, 835 tons; speed, 31.5 knots; armament, three 4.7-inch guns and six torpedo tubes.

Reliable details of modern Japanese submarines are difficult to obtain, for in this respect the naval authorities follow the example of other powers in observing strict reticence. There is, however, reason to believe that the underwater vessels now constructing in Japan will be at least equal in size, sea endurance, and armament to the largest submarines building abroad. A special interest attaches to submarine No. 19, for this boat is—or was until quite recently—the largest submarine in the Japanese Navy, and was also the first ocean-going boat of purely native design. She displaces 890 tons in surface trim and 1200 tons when submerged. The surface speed is 16 knots. Five torpedo tubes are mounted, two of which are in the bows, one in the stern, and two above water on each side of the superstructure. The nominal sea endurance of No. 19 is 6500 sea miles, but the actual cruising radius is probably well above that figure. No 26 is one of the latest boats, having been completed for service early in the present year. Her displacement when submerged is about 1000 tons, and her speed on the surface 16.5 to 17 knots. With two-thirds of her maximum fuel supply on board she can travel a distance of 7500 sea miles. The torpedo armament is limited to four tubes, but a quick-firing gun is mounted on the deck—3-inch in some boats of this series, 4.7-inch in others. In the later submarines now in hand an attempt has been made to increase the radius of action very considerably, for it is recognized that cruising endurance is of the utmost importance in submarines designed for operations in the Pacific. In future, it is said, the Japanese naval authorities will concentrate on two distinct types: (1) Submersible cruisers of good speed, mounting a powerful gun and torpedo armament, and in some cases equipped for mine-laying; and (2) smaller ocean-going vessels, not exceeding 1000 tons, of 17 to 18 knots speed, and carrying a lighter armament. According to one account, "the purely coastal type will not be perpetuated, for experience has shown that it is false economy to construct diminutive submarines when the addition of a couple of hundred tons in displacement endows a boat with good sea-going qualities and a far higher degree of all-round fighting value." The big *versus* little ship controversy has seemingly spread to Japan, for the naval authorities have been criticised by a section of the press for continuing to build heavy armored ships instead of devoting the equivalent in money and labor to the construction of a multitude of submarines. Nevertheless, the official policy, as explained by the Minister of Marine nearly two years ago, remains unaltered. Speaking in the Imperial Diet, Admiral Kato said: "The more we study the lessons of the war, the stronger does our conviction grow that the last word in naval warfare rests with the big ship and the big gun."—*The Engineer*, 25 November, 1921.

JAPAN AND NAVAL BALANCE.—While there is no change in the note of general approval which has been accorded to Mr. Hughes's proposal as affording evidence of America's sincerity, and while it is everywhere conceded that Japan will be second to none in advocating a drastic limitation of armaments, the belief that Japan should put forward a demand for a fairer balance of naval power is daily growing more conspicuous in comments expressed on the Conference.

The newspaper *Kokumin Shimbun* voices the opinion, which is held in many quarters, that Japan would be justified in insisting on the retention of her fleet in the ratio of 70 per cent to that of the American Navy, considering the needs of national defence and the industrial capacities as well as geographical conditions of the two Powers.—*Naval and Military Record*, 23 November, 1921.

JAPANESE AERIAL NOTES.—Japanese newspapers report that the Army Balloon Corps will participate in the maneuvers with the Imperial Guards Division at Suson near Mt. Fuji. The model R captive balloon will be used for observation purposes. Five officers of the Balloon Corps and several additional observation officers will take part.

Ten civilian aviation students at the Army Flight School at Tokorozawa graduated August 31. This is the first civilian class at Tokorozawa, but it is expected that these classes will be continued regularly in the future.

A small, non-rigid type airship was recently purchased by the Japanese Government from the Vickers Co., London, according to the Japanese magazine *Aviation*. The airship performed its final test of four hours' continuous flight successfully, only thirty men being required to handle it, and it ascended and descended very readily. The airship is described as having one "ship" in the center, capacity five men, and with a speed of over 50 m. p. h.

The graduation flight of the Naval Air School at Yokosuka took place on July 10. The course was from Oppama (near Yokosuka) to Shinmaiko and return, six graduates taking part. Only one machine reached the latter place, the other planes being forced to descend into the sea. Bad weather conditions prevented this one plane from attempting the return journey.—*Aviation*, 21 November, 1921.

JAPANESE AVIATION.—It appears that Japan is sparing no efforts of expense to building up a great military and civil air force. From England representatives of Messrs. Short Brothers and from the Sopwith Aviation Company have gone to the East to superintend the building of British-designed machines. In addition, a number of R. A. F. officers have gone to Japan to organize the Japanese naval air service. Japan has enrolled some of the leading British designers and engineers. Shipbuilding firms have acquired foreign licenses for the manufacture of naval aircraft and aeronautical engines, and several European firms have established branches in Japan. In addition, military and naval deputations from the East have been for some time inspecting factories and machines in Great Britain, and orders for British, French and Italian machines have been placed with various firms.—*Aerial Age Weekly*, 28 November, 1921.

N. Y. K. ADDING TO FLEET.—The plan to construct a new mercantile fleet amounting to 500,000 tons proposed by the Nippon Yusen Kaisha during the President Kondo's tenure of office, which has been suspended since the orders for the construction of 150,000 tons were placed with the Yokohama Dockyard, is reported about to be resumed.—*Nautical Gazette*, 26 November, 1921.

## UNITED STATES

## NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION,  
AS REPORTED NOVEMBER 30, 1921

Type, number and name		Contractor	Per cent of completion			
			Dec. 1, 1921		Nov. 1, 1921	
			Total	On ship	Total	On ship
<i>Battleships (BB)</i>						
45	Colorado.....	New York S. B. Cpn.....	84.9	83.8	83.0	81.6
47	Washington.....	New York S. B. Cpn.....	69.8	63.6	69.8	63.6
48	West Virginia.....	Newport News S. B. & D. D. Co.	65.7	59.3	64.0	57.3
49	South Dakota.....	New York Navy Yard.....	36.5	29.5	35.2	27.7
50	Indiana.....	New York Navy Yard.....	33.9	26.3	33.2	25.1
51	Montana.....	Mare Island Navy Yard.....	27.6	19.	27.6	19.0
52	North Carolina.....	Norfolk Navy Yard.....	36.7	27.1	36.7	27.1
53	Iowa.....	Newport News S. B. & D. D. Co.	30.7	25.8	29.9	25.5
54	Massachusetts.....	Beth. S. B. Cpn. (Fore River)..	11.0	4.3	10.4	3.9
<i>Battle Cruisers (CC)</i>						
1	Lexington.....	Beth. S. B. Cpn. (Fore River)..	28.8	19.3	26.7	17.8
2	Constellation.....	Newport News S. B. & D. D. Co.	17.1	15.0	15.5	13.7
3	Saratoga.....	New York S. B. Cpn.....	31.0	23.6	29.4	22.2
4	Ranger.....	Newport News S. B. & D. D. Co.	3.5	1.3	2.9	1.2
5	Constitution.....	Philadelphia Navy Yard.....	12.3	7.3	11.7	6.8
6	United States.....	Philadelphia Navy Yard.....	11.5	6.5	11.1	6.2
<i>Scout Cruisers (Light Cruisers CL)</i>						
4	Omaha.....	Todd D. D. & Const. Cpn.....	98.4	91.7	96.8	89.6
5	Milwaukee.....	Todd D. D. & Const. Cpn.....	93.6	86.0	93.4	86.0
6	Cincinnati.....	Todd D. D. & Const. Cpn.....	87.4	81.0	87.4	80.8
7	Raleigh.....	Beth. S. B. Cpn. (Fore River)..	63.7	45.6	63.7	45.6
8	Detroit.....	Beth. S. B. Cpn. (Fore River)..	74.4	58.1	71.6	54.1
9	Richmond.....	Wm. Cramp & Sons Co.....	81.	73.	78.	70.
10	Concord.....	Wm. Cramp & Sons Co.....	74.	65.	71.	60.
11	Trenton.....	Wm. Cramp & Sons Co.....	53.	40.	52.	39.
12	Marblehead.....	Wm. Cramp & Sons Co.....	47.	33.	47.	33.
13	Memphis.....	Wm. Cramp & Sons Co.....	40.	26.	40.	26.
<i>Auxiliaries</i>						
Repair Ship No. 1, Medusa (AR 1).....		Puget Sound Navy Yard.....	72.5	60.9	70.6	56.7
Dest. Tender No. 3, Dobbin (AD 3).....		Philadelphia Navy Yard.....	66.6	66.3	66.4	66.1
Dest. Tender No. 4, Whitney (AD 4).....		Boston Navy Yard.....	41.3	35.0	36.8	33.3
Sub. Tender No. 3, Holland (AS 3).....		Puget Sound Navy Yard.....	21.5	5.5	21.5	5.5
Aircraft Tender, Wright (AZ 1).....		Tietjen & Lang.....	99.3	.....	96.	....
<i>Patrol Vessels</i>						
Gunboat No. 22, Tulsa (PG 22).....		Charleston Navy Yard.....	71.2	56.6	71.1	55.7
<i>Destroyers</i>						
338	Wasmuth.....	Mare Island Navy Yard.....	99.9	99.9	99.7	99.7
339	Trever.....	Mare Island Navy Yard.....	98.0	98.0	97.7	97.7
340	Perry.....	Mare Island Navy Yard.....	82.7	82.2	79.5	78.8
341	Decatur.....	Mare Island Navy Yard.....	79.5	79.0	73.7	73.0

Authorized but not under construction or contract: (1) Transport No. 2.  
Destroyers authorized but not under construction or contract: (12)  
Nos. 348 to 359 inclusive.

There are 37 submarines and 4 fleet submarines under construction.

There are 1 submarine and 6 fleet submarines authorized but not under construction or contract.

**LIMITATION OF ARMAMENTS.**—The Conference on the Limitation of Armaments was opened on November 12 by President Harding, who delivered an address. The Secretary of State, Mr. Hughes, was made presiding officer and, following an address, gave details of the American proposal as to a reduction or limitation of armaments.

On Tuesday Great Britain and Japan accepted, in principle, the proposal made by Mr. Hughes.

Secretary Hughes at the close of the meeting on Monday gave out the following statement:

"The first meeting of the committee on limitation of armament was held in the Pan-American Building at 4 p. m.

"There were present the delegates of the United States of America, the British Empire, France, Italy, and Japan, with a secretary for each delegation, and the secretary-general of the conference, who was chosen secretary of the committee.

"A sub-committee composed of one technical naval adviser for each of the five powers was constituted to take under immediate advisement the questions raised by the proposal of the United States for a limitation of naval armaments and to report to the committee from time to time the progress of their deliberations. The sub-committee is composed of the following: Colonel Roosevelt, Admiral Beatty, Vice Admiral De Bon, Vice Admiral Acton, and Vice Admiral Kato, with full power of substitution for each adviser. At the suggestion of Mr. Balfour it was agreed that Colonel Roosevelt should act as chairman of this sub-committee.

"The committee adjourned to meet at the call of the chairman."

The following sub-committees were appointed by the American delegation in connection with the agenda of the conference:

**Executive committee**—Mr. Sutherland, chairman *ex officio*; Mrs. Eleanor Franklin Egan, secretary; Undersecretary of State Fletcher, Samuel Gompers, Secretary Hoover, Assistant Secretary Roosevelt, former Senator Willard Saulsbury, of Delaware, and W. Boyce Thompson, of New York.

**Land armament**—General Pershing, chairman; Charles S. Barrett, Mrs. Charles Sumner Bird, Walter George Smith, Representative Stephen G. Porter, Assistant Secretary Wainwright, of the War Department, and John L. Lewis.

**Pacific and Far Eastern questions**—Stephen G. Porter, chairman; Mrs. Katherine Phillips Edson, Mr. Gompers, Mr. Saulsbury, Harold M. Sewell, Mr. Smith, and Mr. Wainwright.

**Naval armament**—Rear Admiral Rodgers, chairman; Governor John M. Parker, of Louisiana; Mr. Sewell, Mr. Smith, Carmi A. Thompson, Mr. Wainwright, and Mrs. Thomas G. Winter.

**New weapons of warfare**—Carmi A. Thompson, chairman; Mrs. Edson, Mr. Lewis, Governor Parker, General Pershing, Admiral Rodgers, and Mr. Roosevelt.

**General information**—William Boyce Thompson, chairman; Mr. Barrett, Mrs. Bird, Secretary Hoover, Mr. Lewis, Governor Parker, and Mrs. Winter.

The proposal of the United States for a limitation of naval armaments follows:

The United States proposes the following plan for a limitation of the naval armaments of the conferring nations. The United States believes that this plan safely guards the interests of all concerned:

In working out this proposal, the United States has been guided by four general principles:

(a) The elimination of all capital ship-building programs, either actual or projected.

(b) Further reduction through scrapping certain of the older ships.

(c) That regard should be had to the existing naval strength of the conferring powers.

(d) The use of capital ship tonnage as the measurement of strength for navies and a proportionate allowance of auxiliary combatant craft prescribed.

Proposal for a limitation of naval armaments:

#### CAPITAL SHIPS

##### UNITED STATES

1. The United States to scrap all new capital ships now under construction and on their way to completion. This includes six battle cruisers and seven battleships on the ways and building and two battleships launched.

(Note.—Paragraph 1 involves a reduction of 15 new capital ships under construction, with a total tonnage when completed of 618,000 tons. Total amount of money already spent on 15 capital ships, \$332,000,000.)

2. The United States to scrap all battleships up to, but not including, the *Delaware* and *North Dakota*.

(Note.—The number of old battleships scrapped under paragraph 2 is 15; their total tonnage is 227,740 tons. The grand total of capital ships to be scrapped is 30, aggregating 845,740 tons.)

##### GREAT BRITAIN

3. Great Britain to stop further construction on the four new *Hoods*.

(Note.—Paragraph 3 involves a reduction of four new capital ships not yet laid down, but upon which money has been spent, with a total tonnage when completed of 172,000 tons.)

4. In addition to the four *Hoods*, Great Britain to scrap her pre-dreadnoughts, second line battleships and first line battleships up to but not including, the *King George V* class.

(Note.—Paragraph 4 involves the disposition of 19 capital ships, certain of which have already been scrapped, with a tonnage reduction of 411,375 tons. The grand total tonnage of ships scrapped under this agreement will be 583,375 tons.)

##### JAPAN

5. Japan to abandon her program of ships not yet laid down, namely: The *Kii Owari*, No. 7, No. 8, battleships, and Nos. 5, 6, 7 and 8, battle-cruisers.

(Note.—Paragraph 5 does not involve the stopping of construction on any ship upon which construction has begun.)

6. Japan to scrap three battleships: The *Mutsu*, launched; the *Tosa* and *Kaga*, building, and four battle-cruisers, the *Amagi* and *Akagi*, building, and the *Atago* and *Takao*, not yet laid down, but for which certain material has been assembled.

(Note.—Paragraph 6 involves a reduction of seven new capital ships under construction, with a total tonnage when completed of 288,100 tons.)

7. Japan to scrap all pre-dreadnoughts and capital ships of the second line. This to include the scrapping of all ships up to, but not including, the *Settsu*.

(Note.—Paragraph 7 involves the scrapping of ten older ships with a total tonnage of 159,828 tons. The grand total reduction of tonnage on vessels existing, laid down, or for which material has been assembled is 448,928 tons.)

##### FRANCE AND ITALY

8. In view of certain extraordinary conditions due to the World War affecting the existing strength of the navies of France and Italy, the United

States does not consider necessary the discussion at this stage of the proceedings of the tonnage allowance of these nations, but proposes it be reserved for the later consideration of the conference.

#### OTHER NEW CONSTRUCTION

9. No other new capital ships shall be constructed during the period of this agreement except replacement tonnage as provided hereinafter.

10. If the terms of this proposal are agreed to, then the United States, Great Britain and Japan agree that their navies, three months after the making of this agreement, shall consist of the following capital ships:

#### LIST OF CAPITAL SHIPS

##### UNITED STATES

*Maryland, California, Tennessee, Idaho, Mississippi, New Mexico, Arizona, Pennsylvania, Oklahoma, Nevada, Texas, New York, Arkansas, Wyoming, Utah, Florida, North Dakota and Delaware*; total, 18; total tonnage, 500,650.

##### GREAT BRITAIN

*Royal Sovereign, Royal Oak, Resolution, Ramillies, Revenge, Queen Elizabeth, Warspite, Valiant, Barham, Malaya, Benbow, Emperor of India, Iron Duke, Marlborough, Erin, King George V, Centurion, Ajax, Hood, Renown, Repulse and Tiger*; total, 22; total tonnage, 604,450.

##### JAPAN

*Nagato, Hiuga, Ise, Yamashiro, Fu-So, Settsu, Kirishima, Haruna, Hi-Yei and Kongo*; total, 10; total tonnage, 299,700.

#### DISPOSITION OF OLD AND NEW CONSTRUCTION

11. Capital ships shall be disposed of in accordance with methods to be agreed upon.

##### REPLACEMENTS

12. (a) The tonnage basis for capital ship replacement under this proposal to be as follows:

United States, 500,000 tons.

Great Britain, 500,000 tons.

Japan, 300,000 tons.

(b) Capital ships 20 years from date of completion may be replaced by new capital ship construction, but the keels of such new construction shall not be laid until the tonnage which it is to replace is 17 years of age from date of completion. Provided, however, that the first replacement tonnage shall not be laid down until 10 years from the date of the signing of this agreement.

(c) The scrapping of capital ships replaced by new construction shall be undertaken not later than the date of completion of the new construction, and shall be completed within three months of the date of completion of new construction, or, if the date of completion of new construction be delayed, then within four years of the laying of the keels of such new construction.

(d) No capital ships shall be laid down during the term of this agreement whose tonnage displacement exceeds 35,000 tons.

(e) The same rules for determining tonnage of capital ships shall apply to the ships of each of the powers party to this agreement.

(f) Each of the powers party to this agreement agrees to inform promptly all the other powers party to this agreement concerning:

- (1) The names of the capital ships to be replaced by new construction.
- (2) The date of authorization of replacement tonnage.
- (3) The dates of laying the keels of replacement tonnage.
- (4) The displacement tonnage of each new ship to be laid down.
- (5) The actual date of completion of each new ship.
- (6) The fact and date of the scrapping of ships replaced.
- (g) No fabricated parts of capital ships, including parts of hulls, engines and ordnance, shall be constructed previous to the date of authorization of replacement tonnage. A list of such parts will be furnished all powers party to this agreement.

(h) In case of the loss or accidental destruction of capital ships, they may be replaced by new capital ship construction in conformity with the foregoing rules.

#### AUXILIARY COMBATANT CRAFT

13. In treating this subject auxiliary combatant craft have been divided into three classes:

- (a) Auxiliary surface combatant craft.
- (b) Submarines.
- (c) Airplane carriers and aircraft.

14. The term auxiliary surface combatant craft includes cruisers (exclusive of battle-cruisers), flotilla leaders, destroyers, and all other surface types except those specifically exempted in the following paragraph:

15. Existing monitors, unarmored surface craft as specified in paragraph 16, under 3000 tons, fuel ships, supply ships, tenders, repair ships, tugs, mine-sweepers and vessels readily convertible from merchant vessels are exempt from the terms of this agreement.

16. No new auxiliary combatant craft may be built exempt from this agreement regarding limitation of naval armaments that exceed 3000 tons displacement and 15 knots speed, and carry more than 4-5 inch guns.

17. It is proposed that the total tonnage of cruisers, flotilla leaders and destroyers allowed each power shall be as follows:

For the United States, 450,000 tons.

For Great Britain, 450,000 tons.

For Japan, 270,000 tons.

Provided, however, that no power party to this agreement whose total tonnage in auxiliary surface combatant craft on November 11, 1921, exceeds the prescribed tonnage shall be required to scrap such excess tonnage until replacements begin, at which time the total tonnage of auxiliary combatant craft for each nation shall be reduced to the prescribed allowance as herein stated.

#### LIMITATION OF NEW CONSTRUCTION

18. (A) All auxiliary surface combatant craft whose keels have been laid down by November 11, 1921, may be carried to completion.

(B) No new construction in auxiliary surface combatant craft except replacement tonnage, as provided hereinafter shall be laid down during the period of this agreement, provided, however, that such nations as have not reached the auxiliary surface combatant craft tonnage allowances hereinbefore stated may construct tonnage up to the limit of their allowance.

#### SCRAPPING OF OLD CONSTRUCTION

19. (A) Auxiliary surface combatant craft shall be scrapped in accordance with methods to be agreed upon.

(B) Submarines.



20. It is proposed that the total tonnage of submarines allowed each power shall be as follows:

For the United States, 90,000 tons.

For Great Britain, 90,000 tons.

For Japan, 54,000 tons.

Provided, however, that no power party to this agreement whose total tonnage in submarines on November 11, 1921, exceeds the prescribed tonnage shall be required to scrap such excess tonnage until replacements begin, at which time the total tonnage of submarines for each nation shall be reduced to the prescribed allowance as herein stated.

#### LIMITATION OF NEW CONSTRUCTION

21. (A) All submarines whose keels have been laid down by November 11, 1921, may be carried to completion.

(B) No new submarine tonnage except replacement tonnage as provided hereinafter shall be laid down during the period of this agreement, provided, however, that such nations as have not reached the submarine tonnage allowance hereinbefore stated may construct tonnage up to the limit of their allowance.

#### SCRAPPING OF OLD CONSTRUCTION

22. Submarines shall be scrapped in accordance with methods to be agreed upon.

#### (C)—AIRPLANE CARRIERS AND AIRCRAFT

23. It is proposed that the total tonnage of airplane carriers allowed each power shall be as follows: United States, 80,000 tons; Great Britain, 80,000 tons; Japan, 48,000 tons.

Provided, however, that no power party to this agreement whose total tonnage in airplane carriers on November 11, 1921, exceeds the prescribed tonnage shall be required to scrap such excess tonnage until replacements begin, at which time the total tonnage of airplane carriers for each nation shall be reduced to the prescribed allowance as herein stated.

#### LIMITATION OF NEW CONSTRUCTION, AIRPLANE CARRIERS

24. (a) All airplane carriers whose keels have been laid down by November 11, 1921, may be carried to completion.

(b) No new airplane carrier tonnage except replacement tonnage as provided herein shall be laid down during the period of this agreement, provided, however, that such nations as have not reached the airplane carrier tonnage hereinbefore stated may construct tonnage up to the limit of their allowance.

#### SCRAPPING OF OLD CONSTRUCTION.

25. Airplane carriers shall be scrapped in accordance with methods to be agreed upon.

#### AUXILIARY COMBAT CRAFT, REPLACEMENTS

26. (a) Cruisers 17 years of age from date of completion may be replaced by new construction. The keels for such new construction shall not be laid until the tonnage it is intended to replace is 15 years of age from date of completion.

(b) Destroyers and flotilla leaders 12 years of age from date of completion may be replaced by new construction. The keels of such new construction shall not be laid until the tonnage it is intended to replace is 11 years of age from date of completion.

(c) Submarines 12 years of age from date of completion may be replaced by new submarine construction, but the keels of such new construction shall not be laid until the tonnage which the new tonnage is to replace is 11 years of age from date of completion.

(d) Airplane carriers 20 years of age from date of completion may be replaced by new airplane carrier construction, but the keels of such new construction shall not be laid until the tonnage which it is to replace is 17 years of age from date of completion.

(e) No surface vessels carrying guns of caliber greater than 8 inches shall be laid down as replacement tonnage for auxiliary combatant surface craft.

(f) The same rules for determining tonnage of auxiliary combatant craft shall apply to the ships of each of the powers party to this agreement.

(g) The scrapping of ships replaced by new construction shall be undertaken not later than the date of completion of the new construction and shall be completed within three months of the date of completion of the new construction, or, if the completion of new tonnage is delayed, then within four years of the laying of the keels of such new construction.

(h) Each of the powers party to this agreement agrees to inform all the other parties to this agreement concerning:

(1) The names or numbers of the ships to be replaced by new construction.

(2) The date of authorization of replacement tonnage.

(3) The dates of laying the keels of replacement tonnage.

(4) The displacement tonnage of each new ship to be laid down.

(5) The actual date of completion of each new ship.

(6) The fact and date of the scrapping of ships replaced.

(i) No fabricated parts of auxiliary combatant craft, including parts of hulls, engines and ordnance, will be constructed previous to the date of authorization of replacement tonnage. A list of such parts will be furnished all powers party to this agreement.

(j) In cases of the loss or accidental destruction of ships of this class they may be replaced by new construction.

#### AIRCRAFT

27. The limitation of naval aircraft is not proposed.

(Note.—Owing to the fact that naval aircraft may be readily adapted from special types of commercial aircraft, it is not considered practicable to prescribe limits for naval aircraft.)

#### GENERAL RESTRICTION ON TRANSFER OF COMBATANT VESSELS OF ALL CLASSES

28. The powers party to this agreement bind themselves not to dispose of combatant vessels of any class in such a manner that they later may become combatant vessels in another navy. They bind themselves further not to acquire combatant vessels from any foreign source.

29. No capital ship tonnage nor auxiliary combatant craft tonnage for foreign account shall be constructed within the jurisdiction of any one of the powers party to this agreement during the term of this agreement.

#### MERCHANT MARINE

30. As the importance of the merchant marine is in inverse ratio to the size of naval armaments, regulations must be provided to govern its conversion features for war purposes.—*Army and Navy Register*, 19 November, 1921.

ARMY AND NAVY TRANSPORT.—It is now practically certain that President Harding shortly will issue an order discontinuing the army and navy transport services across the Pacific, and will direct that this traffic be

turned over by the government to commercial lines. The Shipping Board has submitted to the White House information on the cost of these services, and it is understood that the President will follow the recommendations of the Board. This will automatically cancel the previous request of the War Department for the transfer of four of the new 502 combination ships to the army.—*Nautical Gazette*, 26 November, 1921.

**PANAMA CANAL EARNINGS.**—For the fiscal year ending June 30, 1921, the gross earnings of the Panama Canal amounted to \$12,040,116.70 as compared with \$8,935,871.57 in the fiscal year of 1919-20, an increase of \$3,104,245.13. The cost of operation and management for the year of 1919-20 amounted to \$9,328,300.14. Without making any allowance for depreciation of plant or for interest charges on the capital invested, which amounted to \$368,543,271.95 on June 30 last, the Canal made a profit in the last fiscal year of \$2,711,816.56. Since the opening of the Canal the excess of revenues over expenses has amounted to \$480,724.95.—*The Nautical Gazette*, 5 November, 1921.

**LARGER DIESEL ENGINED SHIPS.**—On June 30 last there were 145 full-powered Diesel engined ships of over 2000 gross tons. These were divided among the following flags:

	Number	Gross tons
British .....	34	217,104
Danish .....	21	121,580
Swedish .....	20	91,681
American .....	28	86,457
Norwegian .....	21	85,032
Italian .....	6	26,449
All other .....	15	63,467

In addition to these large motor ships there were 553 small Diesel-engined vessels, aggregating 210,118 gross tons. Of this number, 59 were American vessels, totaling 27,521 gross tons.

The United States leads in sailing ships equipped with Diesel or semi-Diesel engines for auxiliary power. It owns 61 such ships, aggregating 60,103 gross tons.—*Nautical Gazette*, 19 November, 1921.

**BOARD OFFERS SHIPS AT WORLD MARKET PRICES.**—In accordance with instructions issued by Chairman Lasker, the Shipping Board is advertising for bids on the transport *Northern Pacific* and 28 cargo carriers. These ships are being offered at world market prices. In the case of the *Northern Pacific*, which is a vessel of 8255 gross tons and of 20 knots speed, the offers must be submitted before December 12. Bids on the other vessels will be opened on December 21. They include the following: Three 12,000 dead-weight freighters, *South Bend*, *Marica* and *Edyllen*, built by the Sun Shipbuilding Company; *Eastern Merchant*, 12,000 tons, built in Japan by the Asano Shipbuilding Company; five Japanese vessels, *Eastern Trade*, 12,975 tons; *East Indian*, 11,679; *Eastern Shore*, 11,054; *Eastern Light*, 10,705; *Eastern Soldier*, 10,625; four Chinese-built freighters, *Mandarin*, *Cathay*, *Celestial* and *Oriental*, 12,000 tons, constructed by the Kiangnan Dock & Engine Works, Shanghai.

Two 5740-ton freighters, *Chickamauga* and *Pinellas*, built by the Merrill-Stevens Shipbuilding Corporation; four 5175-ton cargo carriers, *Bethnor*, *Macomet*, *Mason City* and *Maddequet*, built by the Bethlehem Shipbuilding Corporation; four 5075-ton fabricated steel ships, *Tashmoo*, *Toledo Bridge*, *Orinoko* and *Suwied*, built by Submarine Boat Corporation; two 5300-ton colliers, *Absecon* and *Tuckahoe*, built by New York Shipbuilding Corporation; *Minooka*, 5000-ton cargo, Mobile Shipbuilding Company; *Delfina*, 5210 tons, Hanlon Dry Dock & Shipbuilding Company; *M. J. Scanlon*,

8597 tons, New York Shipbuilding Corporation. In addition, three 150-foot sea-going tugs and four 1800-ton steel oil barges are being offered for sale.—*Nautical Gazette*, 3 December, 1921.

**SHIPPING BOARD'S FIRST BALANCE SHEET.**—The first full balance sheet ever prepared to cover the business of the Shipping Board was laid before Chairman Lasker last week. It is said to represent four months' work by accountants.

The total assets of the Board as of July 1 are shown as \$307,400,000, exclusive of unexpected appropriations and the value of the fleet, and the total liabilities, exclusive of pending claims, as \$115,878,000. The balance on hand, \$191,500,000, offsets in part claims estimated at \$200,000,000 to \$300,000,000.

Detailed items of the report are as follows:

#### ASSETS

Cash on hand .....	\$33,000,000
Accounts and notes receivable.....	33,954,000
Accounts receivable from managements.....	9,360,000
Operation supplies .....	10,850,000
Surplus materials for sale at inventory valuation.....	35,561,000
Land, structures and equipment for sale.....	42,229,000
Mortgages receivable and securities.....	10,865,000
Accounts and notes receivable from ship sales, not secured by mortgages .....	16,375,000
Notes receivable secured by mortgages.....	98,997,000
Real estate and equipment in operation.....	3,967,000

#### LIABILITIES

Accounts and vouchers payable, refunds of deposits and collections .....	\$71,482,000
Mortgage bonds and mortgages payable, assumed upon acquisition of certain properties .....	2,109,000
Reserve against inventories of surplus materials and land, structures and equipment, including depreciation.....	42,287,000

According to President Joseph W. Powell, of the Emergency Fleet Corporation, the Shipping Board has lost about \$25,000,000 since July 1, which has been more than offset by the appropriation of \$48,000,000 granted by Congress.—*Nautical Gazette*, 26 November, 1921.

**NEW SAN FRANCISCO-MEXICAN SERVICE.**—The *Compania Naviera de los Estados Unidos de Mexico* (Mexican States Line) will begin, in the latter part of this month, a new passenger and freight steamship service between San Francisco and ports of Mexico and Central America. Fortnightly sailings are contemplated. The six vessels to be used in the new service are the *Sinola*, *Chihuahua*, *Chiapas*, *Oazaca*, *Colima* and *Guerrero*. They will fly the Mexican flag and are under contract with the Mexican Government to carry mail. They have accommodations for seventy first-class passengers, sixty second-cabin and fifty steerage and have a cargo capacity of about 1500 tons. They are 270 feet long.—*Nautical Gazette*, 12 November, 1921.

**BATTLE-CRUISERS AS PASSENGER STEAMERS.**—Talk of scrapping our battle-cruisers after the disarmament conference has brought forth the usual number of weird proposals, one of which is that these vessels might be converted into vast passenger steamers of the *Aquitania* type. The amateur marine architects who made this brilliant suggestion apparently overlooked the fact that battleship and passenger ship hulls are totally unlike and that no amount of rebuilding could effect the desired transformation. A scheme just about as practicable was recently sprung by one of the editorial writers on an evening newspaper, who suggested that in view of the present

scarcity of housing accommodation the fleet of idle Shipping Board vessels might be moored along the east and west rivers and take in roomers.—*Nautical Gazette*, 3 December, 1921.

**LLOYD'S 1920 WRECK FIGURES.**—Lloyd's Register has just published its statistical summary of vessels totally lost at sea in 1920. According to its figures 585 vessels of 657,554 gross tons were lost from all causes. Of the total number of vessels lost 215 were sailing vessels with an aggregate tonnage of 138,950 and 370 vessels with a combined tonnage of 518,595 were steam.

The causes of loss are set forth in the following table:

How Lost	Number	Gross tons
Abandoned at sea .....	60	52,585
Foundered .....	80	53,878
Missing .....	43	46,665
Broken up, condemned, etc.....	9	9,454
Burnt .....	52	95,077
Collision .....	36	38,399
Wrecked .....	255	322,066
Lost, etc. ....	26	24,479
Total .....	561	645,603

The following table shows the number of vessels of each flag listed which were included in the total of vessels lost:

Flag	Number	Tonnage	Percent- age of tonnage
United Kingdom .....	99	131,481	0.76
British dominions .....	64	29,022	1.39
American .....	108	159,694	1.16
Danish .....	22	6,646	0.83
Dutch .....	15	4,417	0.25
French .....	40	63,866	1.97
German .....	19	10,280	1.53
Italian .....	10	13,287	0.59
Japanese .....	29	41,988	1.40
Norwegian .....	42	52,648	2.37
Russian .....	7	15,529	2.91
Spanish .....	18	14,826	1.49
Swedish .....	23	23,026	2.15
Other European countries.....	52	54,307	....
Central and South America.....	9	12,149	....
Other countries .....	3	5,377	....
No flag .....	1	7,060	....

The number and tonnage of vessels lost during the last ten years, excluding those lost through war causes, were as follows:

Year	Number	Gross tons
1911 .....	888	884,843
1912 .....	680	748,965
1913 .....	665	717,030
1914 .....	605	682,835
1915 .....	582	793,975
1916 .....	598	226,937
1917 .....	619	777,105
1918 .....	567	748,538
1919 .....	666	636,830
1920 .....	585	657,554

—*Nautical Gazette*, 19 November, 1921.

OCTOBER SHIPBUILDING OUTPUT IN DETAIL.—The Bureau of Navigation, Department of Commerce, reports 71 sailing, steam, gas and unrigged vessels of 50,265 gross tons built in the United States and officially numbered during the month of October, 1921, as follows:

	Atlantic and Gulf		Pacific		Great Lakes		Western Rivers		Total	
	No.	Gross	No.	Gross	No.	Gross	No.	Gross	No.	Gross
<i>Wood</i>										
Sailing.....	3	4,535	..	.....	..	..	..	.....	3	4,535
Steam.....	1	385	..	.....	..	..	1	55	2	440
Gas.....	26	1,988	9	228	3	62	5	163	43	2,441
Unrigged.....	6	1,304	..	.....	..	..	4	58	10	1,362
Total.....	36	8,212	9	228	3	62	10	276	58	8,778
<i>Metal</i>										
Sailing.....	..	.....	..	.....	..	..	..	.....	..	.....
Steam.....	3	13,065	3	22,008	..	..	1	1,537	7	36,610
Gas.....	2	571	1	3,803	..	..	1	59	4	4,433
Unrigged.....	2	444	..	.....	..	..	..	.....	2	444
Total.....	7	14,080	4	25,811	..	..	2	1,596	13	41,487
<i>Summary</i>										
Sailing.....	3	14,080	..	.....	..	..	..	.....	3	4,535
Steam.....	4	13,450	3	22,008	..	..	2	1,592	9	37,050
Gas.....	28	2,559	10	4,031	3	62	6	222	47	6,874
Unrigged.....	8	1,748	..	.....	..	..	4	58	12	1,806
: Grand total...	43	22,292	13	26,039	3	62	12	1,872	71	50,265

The above total includes 19 rigged vessels of 2191 gross tons and 3 unrigged vessels of 639 gross tons, total 22 vessels of 2830 gross tons built in years previous to 1921. There were not any vessels built for the United States Shipping Board or for foreign owners during the month of October, 1921. The largest vessels delivered during the month were the tankers *F. H. Hillman* and *Birkenhead* of 9835 and 6960 gross tons respectively.—*Nautical Gazette*, 19 November, 1921.

CONCRETE TANKER "FAITH" JUNKED.—In the Bureau of Navigation's bulletin of changes in American documented sea-going merchant vessels during October, the name of the concrete tanker *Faith* is subtracted on account of the vessel having been sold for junk. She is of 3427 gross tons and was built by the San Francisco Shipbuilding Co. only three years ago. The *Faith* was the first large concrete ocean-going vessel ever constructed.—*Nautical Gazette*, 26 November, 1921.

## AERONAUTICS

HELIUM FOR AIRSHIPS.—In the course of an interview with a correspondent of a British newspaper shortly following the recent *ZR2* airship disaster, Maj. P. E. Van Nostrand, of the Balloon and Airship Division, Office of the Chief of Air Service, who was to have returned to America aboard the big dirigible, asserted that airships can be made safe, and that while helium is the best gas known for airships—and he hoped the time will

come when not only naval and military airships, but commercial airships as well, will be filled with helium—gasoline rather than hydrogen is the greater menace to the safety of airships. He is of the opinion that hydrogen can be used, and used safely, pointing to the fact that the hydrogen gas in the latter part of the *ZR2* apparently did not explode, but came down intact, demonstrating that buoyant gas, if it stays in the bag, is a help rather than a danger. He added that if the *ZR2* had been filled with helium, the result of the accident would have been little more than a casual wetting for the men aboard her—provided a less explosive fuel than gasoline had been in use.

*Supply Still Limited.*—At the present time, in view of the fact that the supply of helium is very limited and difficult to obtain, the problem is to find a less volatile liquid for burning than gasoline, and this, in Major Van Nostrand's opinion, is an easier proposition to obtain than helium.

Commercially pure helium has 92.6 per cent lift of pure hydrogen, and being absolutely inert has no deteriorating effect upon balloon fabrics, and is safe from combustion under all conditions.

Up to April, 1918, helium had been obtained only in extremely small quantities, and for scientific purposes only—the total amount probably not exceeding 100 cubic feet, at a cost of about \$1700 to \$2000 per cubic foot. The most promising fields thus far discovered are located in Texas, Kansas, and Ohio. It is believed by scientists that other sources of supply will be discovered, susceptible of development for the production of helium in balloon quantities, as the result of exploration work. At the present time such an exploration program is being actively prosecuted by the government.

After our entry into the war three experimental plants for the production of helium from natural gas obtained from the Petrolia pool at Petrolia, Texas, were erected. Two of these, known as Plants No. 1 and No. 2, were located at Fort Worth, Tex., the gas being supplied through a pipe line from the former place, and the last plant, known as Plant No. 3, was established at Petrolia.

*Cost of Production.*—The cost of producing one cubic foot of helium in a mixture of 92 per cent purity in Plant No. 1, the most successful plant to date, was about 39 cents, showing the extremely remarkable reduction in the price of producing helium, especially when the fact that this was an experimental plant and not of such proportions as to give lowest cost, is taken into consideration.

After helium of 92 per cent purity was produced in Experimental Plant No. 1, the navy, acting for the army and navy, entered into a contract with the Linde Co. for the erection of a large production plant at Fort Worth. Latest figures on the cost of producing helium in the new production plant, as estimated by the Navy Department, which is in charge of its operation, show that 94.5 per cent helium costs \$150.01 per 1000 cu. ft., and 92.9 helium as \$280.12 per 1000 cu. ft.

Helium provides the United States with a weapon of warfare which is apparently not available to any other nation, because nearly all of the practical supplies of helium so far discovered are contained within the borders of this country. On account of the anticipated further reduction in the cost of this product below the present figure, it would seem advisable that the government should not relax its endeavors to further the exploration and development of this gas, for with an adequate supply of helium the future of the military airship in this country would be assured.

The average production of helium in this country at the present time is such that, when compared with the production figures in the past, would indicate that helium production is making encouraging progress.

One of the most important problems that will have to be solved in connection with the use of helium in lighter-than-air craft is the question of its loss by expansion and consequent valving. Due to the excessive cost of this gas, a radical departure will have to be made in the method of hand-

ling the gas pressure than obtains at present with automatic valves in type R balloons and airships. The navy is preparing to conduct aerial experiments with helium in an airship of the C type, and the U. S. Army Air Service will do likewise upon the completion of an airship that is being designed particularly for the use of helium.

With regard to the repurification of helium, the Army Air Service has two plants under construction for conducting this work—one the Railroad Repurification Plant in Washington, and the other a stationary Repurification Plant at Langley Field, Hampton, Va., both of which are under the jurisdiction of the Bureau of Mines.

*Helium Repurification Plant.*—The Railroad Repurification Plant at Washington is now approaching completion, and consists of two cars, one utilized for producing power for the operation of the apparatus contained on the other car. This apparatus, through the process of refrigeration, absorbs the impurities (consisting principally of air—contained in the helium. The capacity of this plant is approximately 2000 cu. ft. per hour. Being built on standard railroad cars, the plant is capable of being transported to any section of the country upon short notice. It is intended to utilize it for repurification of helium in use at isolated stations where it is inadvisable to locate permanent repurification plants, the impure helium, at these stations being allowed to collect for a period of six months or so, stored in cylinders and then repurified upon the annual or semi-annual visit of the Railroad Repurification Plant.

The plant at Langley Field, Va., which was designed and developed for the Army Air Service by Dr. Harvey M. Davis, Mechanical Engineer, Harvard University, has a capacity in excess of 2000 cu. ft. per hour, and the method used is the liquification of impurities from the helium. Dr. Richard B. Moore, Chief Chemist of the Bureau of Mines, is in charge of this plant, assisted by Mr. Ferris of that Bureau, the latter being stationed at Langley Field. The plant is operated in conjunction with the hydrogen plant at this station.

It is anticipated that both the Railroad Repurification Plant and the plant at Langley Field will be ready for operation about the first of next year. The successful operation of these plants is assured, inasmuch as the laboratory designs which have been tested out have proved very successful.

*Airship C-2 to Experiment with Helium.*—Plans are in progress to make practical use of helium in navy airships in the near future. An immediate start is to be made in the experimenting with this gas at the naval air station, Hampton Roads, Va., where a non-rigid airship of the C class will be inflated.

This experimentation is being conducted in connection with tests in regard to buoyancy, valve control, permeability of airship fabric, and methods of handling helium in connection with all types of lighter-than-air craft. This will be the first airship in the world to be so inflated, and it is expected that important data will be obtained, which it is hoped will be of considerable value in future employment of the gas. This is in accordance with the provisions laid down by the Aeronautical Board of the army and navy for the experimentation and development of lighter-than-air craft.—*Aviation*, 28 November, 1921.

**THE "ROMA" IN TEST FLIGHT.**—The semi-rigid airship *Roma*, purchased from Italy by the United States, made her first test flights November 15, remaining in the air nearly four hours.

Officers at Langley Field, where the *Roma* was assembled, described the flight as most successful.—*Aerial Age Weekly*, 5 December, 1921.

**AERIAL LIFEBOAT.**—A lifeboat for the air is a new contrivance being perfected in London for safety of passengers flying over water. It is an



evolution of the parachute, by means of which the passengers can be released from a flying craft and dropped gracefully.

The device is so arranged that a pilot, when convinced that the chances of saving the lives of his passengers are extremely remote, simply pulls a lever, which releases the passenger compartment from the falling flying machine. The whole operation requires only four seconds. Tests have already proved satisfactory.—*Aerial Age Weekly*, 21, November, 1921.

**MINE-LAYING AIRPLANES.**—With the experimental work in the tactical use of aircraft such as the making of smoke clouds to hide formations and maneuvers, the dropping of toxic gas bombs from aircraft, and the construction of airplane carrier ships, it may be expected that the Naval Air Service will conduct tests of harbor and inlet protection with mines laid from airplanes. It would be an enormous task, and an expensive one in time and material, to cover any large area in this manner, but where there exists the combination of a limited period of time for the work and a small area to be covered airplane mine-laying might reasonably be expected to be successful. Little has been done along this line, though the Germans did successfully attempt the method on the Baltic Sea in 1917, we are reminded by Aviation, using seaplanes of the float type, known as torpedo planes. These were two-engined machines using either 200 horsepower Benz or 260 horsepower Mercedes engines. The use of twin floats permitted the attachment of the mine, or torpedo, between them and under the fuselage. A release system was arranged so that the mine could be freed by the pilot. These airplanes were normally loaded with eight 110 pound bombs or one torpedo. In laying mines, the airplane was flown within 10 to 15 feet of the water, and the mines, which weighed 800 pounds, with an explosive charge of 440 pounds, were released, automatically anchoring after sinking to a predetermined depth.—*Scientific American*, December, 1921.

**NAVY TO TEST DORNIER BOAT.**—The navy department is arranging for a special demonstration of the German *Dornier* all-metal flying boat, to be held at the naval aircraft factory in Philadelphia for the benefit of aeronautical manufacturers and engineers.

Secretary Denby said that it had been the policy of the Navy Department to purchase abroad examples of metal construction in order to study the latest development in the art. These tests at Philadelphia will include demonstration in flight of the *Dornier* flying boat, which is a post-war product of the Zeppelin Company, and was originally designed for commercial passenger service. Several other examples of foreign construction will be available for the detailed examination of the engineers invited to witness the demonstration.—*Aerial Age Weekly*, 21 November, 1921.

**MOTORLESS AEROPLANE RECORD FLIGHT.**—Interest in the motorless air machine has been stimulated by the arrival at Croydon Aerodrome of the *Aachen* glider, with which a flight extending over 20 minutes was made at a recent trial. The machine, which was launched from a hill 1000 feet high, is reported to have been maneuvered to an even higher level and to have made a landing at a point only 30 feet below the original height of 1000 feet. The previous time record for flights in machines of this type was beaten by six minutes. It is understood that other types of German gliders are likely to be sent to England, and that a series of gliding tests will be carried out. Aviation optimists suggest that it might be possible to produce for sporting purposes an aeroplane designed on the lines of motorless gliders, but which, fitted with an engine of about two and one-half horsepower, would be able to make comparatively long low-speed flights.—*The Engineer*, 18 November, 1921.

"ROMA" IS READY.—The *Roma*, America's largest airship, is now ready to make her maiden flight in this country. For several months the big ship has been under construction in the big airship hangar at Langley field. Now she awaits the word which will open the giant doors of her berth and release her anchorage preparatory to the test flight which will later be followed by an exhibition and trial flight or cruise.

A special docking rail is being constructed leading from the landing field to the hangar. The first flight will probably be made before this feature is completed, although it will be necessary to call upon the entire personnel of the field to handle the ship with security when this mechanical arrangement is not utilized.

The thousands who have watched with interest the construction of the airship and hope to see her in flight will appreciate the statement for which Major Thornell, who is in command of the *Roma*, is authority, that at least 24 hours' notice will be given the residents of Langley field and vicinity of the time of the first flight of the big ship.

The crew of the *Roma* will consist of from 12 to 15 enlisted men, while four or five officers in addition to the commander of the ship will be on board on all flights.

One feature of the ship is the photographic department, provision being made not only for the usual taking of aerial pictures but also for the development and printing of negatives while in flight. A complete photographic dark room is being fitted up in a roomy compartment directly under the passenger cabin.

Another interesting and practicable feature is the powerful radio equipment which is being installed which will enable persons on board to converse with ease with other aircraft or land stations many miles removed from the mighty ship of the air.—*Aerial Age Weekly*, 21, November, 1921.

NEW AIRSHIP "NAPOLI" IS TO ECLIPSE "ROMA."—The giant airship *Roma*, which Italy sold to the United States Government, is looked upon as such a great success that the Italian air authorities are building another on much the same lines, only bigger and better, profiting by experience. It will be called the *Napoli* or *Naples*, and probably will be the second of a large fleet of air monsters.

The *Roma* measures 34,000 square meters; the *Napoli* will be 54,000. Like the *Roma*, the *Napoli* will be of the semirigid type. Her shape will be much the same as the sister airship though more elongated.

As in the case of the *Roma*, the car will be in the steel beams of the ship. It will hold a commandant's cabin with all necessary instruments, a passengers' cabin, a dining room, lounges and a kitchen run with electricity.

At the rear of the ship will be terraces for the passengers to admire the scenery at their ease.

There will be 12 Spa motors of 300 horsepower each, Italian designed and constructed. They are to be set tandem, and may be repaired and even changed, if needful, during flight.

The *Napoli* will be able to carry a hundred passengers. With only four of its engines working its speed is expected to be 43 miles an hour.—*Aerial Age Weekly*, 5 December, 1921.

"HELICOPTER" FLIGHT.—In an interesting article in the London Observer Major C. C. Turner comments on *Helicopter* flight as follows:

Experiments with *Helicopters*—machines with horizontal screws giving vertical ascension—are being carried on in many countries, and in Great Britain, the United States, and France are helped by the government. The results of late have been far more encouraging to the inventors than were those obtained before the war, and there is no doubt that the great progress in aerodynamics due to aeroplane research, especially under the stimulus of the war, is helping the helicopterist.

References to *Helicopter* experiments are often sensational. It is made to appear that vertical flight is what the whole aeronautical world is breathlessly awaiting; that it will revolutionize flying, since it would enable machines to land on flat roofs and to hover over an enemy. Yet upon consideration one seriously doubts whether even complete success with the *Helicopter* would make much difference; although one would not go so far as to say that experiments are without scientific value.

Criticism of the *Helicopter* usually takes the form of pointing out that, if the engine fail, descent will be as vertical as the ascent and a hundred times as fast. The criticism is met by the assurance that the *Helicopter* whose engine fails may descend slowly, which was proved in England and elsewhere with large-scale models some years ago. Admittedly there are mechanical difficulties in ensuring the rotation in the right direction, under the pressure of the air, of the propellers in the event of engine stoppage; but the difficulties appear to have been overcome by certain experimenters.

Another difficulty is that of securing horizontal speed and direction. This has been solved, theoretically, by a slight inclination of the axis, so that the screws rotate in an inclined plane when, it is claimed, very great speed is attainable. The preservation of balance is another problem which, however, has in theory been solved in more than one way, always, however, by mechanism admittedly complicated. Practical proof has not yet been given; and one cannot but fear that this and other elements of the *Helicopter* proposition will demand a toll of damaged machines and, perhaps, of life.

M. Damblanc, discussing the experiments at a meeting of the Royal Aeronautical Society, had to admit that a descent with engine stopped would be at the rate of about 10 miles per hour; and this, of course, in vertical contact with the ground to a machine weighing half a ton or more, would mean serious risk of wrecking; it would certainly call for a very remarkable shock-absorbing contrivance, which would be very heavy. And, if under the influence of wind, the descent were aslant the difficulties would be increased.

None of the helicopterists can yet claim that balance could be so nicely preserved in the last 100 feet of descent, where the air is so often "uneven," as to make the landing perfect. Still more disturbing is the thought that the engine might fail at so low an altitude that the fall-checking action of the propeller could not take effect.

The aeroplane, on the other hand, lands on a gentle gradient, so that even high speed is, within limits, no danger; and wind makes it easier by reducing the ground speed.

On the whole proposition, including that of the conversion of power expended into useful work done, it would seem that the aeroplane must have the best of the argument. Perhaps the difference between the two may be likened to the difference between using wheels in mechanical traction and attempting imitation legs!

As regards performance, there remain some serious drawbacks to the *Helicopter*. M. Damblanc, one of the foremost workers, has to admit that the utmost height attainable by his design would be about 5000 feet, and that as that height was approached ascent would be extremely slow, and would call for the sacrifice of all impediments. If this, indeed, be the limit, the prospects before the *Helicopter*, whether for war or for commerce, are gloomy. Of course, we must assume that, as in the aeroplane, the limit of to-day will be surpassed to-morrow. But any important development in power, yielding more thrust in proportion to weight, would benefit the aeroplane quite as much as it would the *Helicopter*.

Of reported *Helicopter* experiments may be mentioned those of *Berliner* and of *Hewitt* and *Crocker* in America; the combined aeroplane *Helicopter* of Pescara, the Spanish inventor, which ascended to 3½ feet the other day;

Mr. Louis Brennan's machine in England; and the work of Mr. Ellehammer, the Danish aviator who flew an aeroplane as long ago as 1906. The first helicopterist to be injured was M. de Payer, who broke an arm last year, and is said to have ascended to 400 feet the other day, his machine then being wrecked. Then there is the *Petroczy Helicopter*, which in its first experiments has been held captive on a cable; and it is suggested that it might supersede the kite-balloon, being equally good for observation purposes without offering so big a target or requiring too much space or field equipment.

The aeroplane, meanwhile, is steadily being improved, especially by means of the new high-lift wings. And high-lift wings that could be varied during flight, especially in conjunction with propellers of variable pitch, would greatly increase the range of speed, enabling very fast machines to land slowly and in small spaces.—*Aerial Age Weekly*, 28 November, 1921.

**AID ECUADOR'S AVIATION.**—France and Italy have entered into an agreement with Ecuador with the object of organizing and developing that country's military, maritime, postal and commercial aviation, the Department of Commerce was advised November 17 in a consular report from Guayaquil.

The agreement provides for the establishment of aviation missions in Ecuador to aid in the development of aviation.—*Aerial Age Weekly*, 28 November, 1921.

**IMPROVED PARIS AIR SERVICES.**—The sale of British machines to a French aviation company for use on London-Paris services is a distinct achievement on the part of the British aircraft industry. The Grand Express Aériens, who are the purchasers, have this week taken delivery of a new type Vickers-Vimy aeroplane. This machine, which is fitted with two 450 horsepower Napier "Lion" engines, will carry 14 passengers, and at the designed speed of 130 miles per hour the trip between London and Paris should be performed in one hour and 45 minutes. If rumor can be credited, this British machine is the first of several which are being acquired by the same company.—*The Engineer*, 11 November, 1921.

**FLYING IN FOG.**—Experience has made it quite clear that until a satisfactory device for enabling the pilot of an air machine to fix his position in foggy weather has been produced regular aeroplane services are impossible. Wireless direction finding has done something to simplify the problem, and much interest has been aroused by the claims made for the Reid indicator. The apparatus consists of an upper row of lamps controlled by a mercury device, a lower row controlled by a gyroscope, and an air speed indicator. It is asserted that by means of the signals given by the lamps and indicator it is possible for the pilot to obtain all the information which will enable him to fix his position during fog with practical accuracy, so that point-to-point flying can be undertaken with the certainty of reaching destination. The air speed of the machine, rate of turn, direction of sideslip, and movement necessary to preserve correct course are all recorded for the information of the pilot. As the result of experiments extending over a period of 18 months, those associated with the new device, which is being manufactured by Vickers, Limited, recommend its use with great confidence.—*The Engineer*, 11 November, 1921.

**EXAMINATION OF NAVY RESERVE OFFICERS.**—The following memorandum concerning examinations of reserve and temporary officers for commission in the line of the U. S. Navy, which was prepared by the Bureau of Aeronautics, Navy Department, is of interest:

1. The following tabulation shows in chronological order the sequence of events connected with the examination and recommendations for commis-

sion of certain reserve and temporary officers for commission in the line of the navy under Act of June 4, 1920:

August, 1919—Director of Naval Aviation sent letter to commanding officers of all air stations, commanders air forces, stating that examinations would be held and directed commanding officers to start classes of instruction.

June 4, 1920—Congress passed Act H. R. 13108, authorizing transfer of temporary and reserve officers to permanent rank or grade for which they might be found qualified.

August, 1920—Bureau of Navigation issued a circular letter to the service stating examinations authorized above would be held starting May 16, 1921.

May 16, 1921—Examinations started.

Oct. 6, 1921—Bureau of Navigation published a list of temporary and reserve officers found qualified for permanent commission, as follows:

*Recommendation of Examining Board.*—The following was the recommendation of the Examining Board:

Number who took the examination.....	1651
Number who failed to finish.....	21

Number considered for commissions.....	1630
Number recommended for commissions.....	931
Number recommended for Ch. Warrant and Warrant Grade..	370
Number not recommended.....	329

Total .....	1630
Percentage recommended for commissions.....	57.1 per cent
Percentage recommended for Ch. W. and W. grade.....	22.7 per cent
Percentage not recommended.....	20.2 per cent

Total .....	100.0 per cent
Number of temporaries who took the examination.....	1192
Number of reserves (Classes 1, 2, 3, 4) took examination....	194
Number of reserves (Class 5-Flying Corps) took examination.	244

Total .....	1630
Number of temporaries recommended for commission..	694.. 58.2 per cent
Number of reserves (Classes 1, 2, 3, 4) commission.....	85.. 43.8 per cent
Number of reserves (Class 5) rec. for commission.....	152.. 62.3 per cent

SPENCER S. WOOD,

Rear Admiral, U. S. N., President;

BENJAMIN C. BRYAN,

Rear Admiral, U. S. N., Member;

ROBERT W. MCNEELY,

Captain, U. S. N., Member.

2. From the above it is to be noted that the number of officers of Class 5, reserve (aviation officers) who were recommended for commission by the Secretary of the Navy is higher than any other group of officers taking these examinations.

3. Examinations as held were competitive in nature, similar to examinations held for entrance to the Naval Academy. The examinations were held at the same hour and date all over the world, and examination papers were forwarded to Washington, where they were marked by the Naval Examination Board. Candidates who were unable to be present at the examinations at the hour and date named, due to sickness or other cause, were not permitted to take another examination, this in view of the fact that the examination was of a competitive nature.

4. The Act of June 4, 1920 (H. R. Bill 13108) authorized the admission to the line of the Regular Navy, *in the permanent grades or ranks for which they might be found qualified, of 1200 officers, 500 of whom could be aviation officers (Class 5).*

5. Examinations were given in all professional subjects of which a knowledge is required of line officers of the navy. The law requires, very properly, that all officers, including aviation officers, should qualify in regular line subjects. It must be realized that a naval aviator, in addition to being able to fly, must have a thorough knowledge of navigation, a sufficient knowledge of seamanship, a thorough knowledge of gunnery and weapons used in airplanes, bombs, naval ordnance, spotting and a certain amount of international law in case he should land in a foreign country on a foreign shore. He should understand a certain amount of electricity in order to communicate, as well as for the safety and operation of his plans or balloon. These subjects are necessary, owing to the fact that the majority of naval aviators are later returned to regular duty as line officers. Class 5 officers were given the special privilege of omitting one of the following subjects: navigation, steam engineering, ordnance and gunnery, electricity—and were permitted to take in its place a special examination on aviation subjects. It is a notable fact that quite a number of the class 5 officers did not elect to take their own subject—aviation—and also that a number of them failed to pass in this subject. It will be noted that eleven and a half months elapsed from the time notice was given that the examinations were to be held and the time of holding the examinations, so that they had ample time to prepare themselves. It is true that the bombing experiments took up much time just before the examinations, but had these officers taken advantage of opportunities to study, it is believed that nearly all of them could have passed. At the stations where they were compelled to study, nearly all passed. For instance, at Howden, England, all the reservists and temporaries passed. At San Diego 63 per cent passed, and at Pensacola 57 per cent passed.

6. The aviation questions were prepared by qualified aviators, and the papers were marked by aviators. Great weight was given by the Examining Board to reports on fitness, and the action of the Examining Board was most liberal.

7. Subjects covered by the examination were: Navigation, engineering, ordnance and gunnery, seamanship, international law, military law, electricity, aeronautics, navy regulations.

8. The following was the result of the aeronautic examinations:

Of temporaries .....58.2 per cent passed  
Of reserves—

Classes 1, 2, 3, and 4.....43.8 per cent passed  
Class 5 (aviators) .....62.3 per cent passed

Of 244 Class 5 aviators—

39 took line examinations, voluntarily omitting aeronautic examinations.

205 took aeronautics.

Of 205 aviators who took aeronautics—

81 aviators failed in aeronautics, their own specialty.

Of 31 temporaries who took aeronautics—

17 temporaries failed in aeronautics.

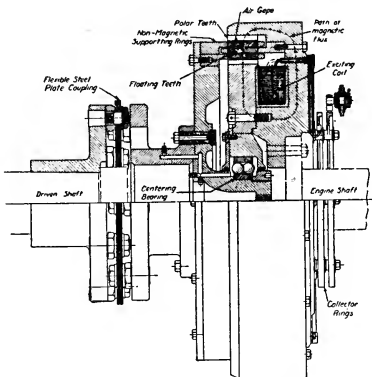
NOTE.—The questions in aeronautics were made up by officers now in Bureau of Aeronautics and were marked by three qualified aviators.

The officers who, through no fault of their own, were prevented from taking the examinations, will be given an opportunity to take an examination.—*Aviation*, 14 November, 1921.

## ENGINEERING

**NEW ELECTRO-MAGNETIC CLUTCH HAS BEEN DEVELOPED FOR DIESEL ENGINE DRIVE.**—A new electro-magnetic clutch has been developed which, operating on a hitherto unused principle, and when used in conjunction with the Diesel type of engine, affords a speed flexibility equalling that of the reciprocating steam engine. This clutch fulfills the requirements of a positive yet completely elastic drive and is a unique correlation of two oppositely applied forces, each producing powerful torques induced and brought under perfect control by the application of a most insignificant amount of external electric energy.

The drive has no sliding parts, is extremely small for power transmitted and is applicable to any range of horsepower. This new type of clutch transmits power entirely through air gaps, and there being no mechanical contact between the driver and driven, wear and deterioration are eliminated. It is capable of remote control and can be operated at any frac-



SPERRY MAGNETIC CLUTCH COUPLING AS USED WITH 700 H. P. DIESEL ENGINE.

tional speed from zero to full engine speed. The power required to operate the clutch at full load is but a small fraction of one per cent of the power transmitted. In one instance 525 horsepower required 256 watts, equal to .065 per cent. One of the outstanding features of the clutch is that on direct drive or full speed it is magnetically locked, which ensures perfect synchronism and no slip with a high pull-out torque.

The diagram on this page shows the detailed construction of one form of a complete embodiment of the clutch. The exciting coil in the driving element induces an intensive magnetic flux which passes through the teeth embedded in non-magnetic current conducting rings. The driven ring constitutes a closed secondary circuit similar to the rotor of a squirrel cage induction motor, which gives high torque at all fractional speeds. The flexible short steel coupling to the extreme left, which may or may not be employed as desired, secures complete freedom of alignment.

In the problem of transmission of power on board ships gears offer a simple solution, but gears have never been successful with reciprocating engines, particularly where the pinions are integral with, or are solidly

locked to, the heavy revolving masses of the engine crank shaft with its characteristic crank effort impulses. No amount of pains to smooth out the peaks by flywheels or other devices have proven successful. Engineers therefore, have resorted to electrical drives, which though they attain in a measure the object of most efficient speed for both engine and propeller, have several drawbacks. They are very heavy, the controls are decidedly extensive and intricate, the first cost is high and they suffer great efficiency losses. In the case of the oil engine the problem is simplified over the turbine in two ways—first, the speeds are lower and, second and more important, the oil engine is capable of full and quick reversal.

It is just here that the new powerful electro-magnetic clutch steps in with its air gap drive, and offers a complete solution.

It permits complete latitude as to propeller shaft speed regardless of the engine speed, the clutch being designed and organized to allow a degree of slip or fractional driving for definite periods.

It constitutes a perfect complement to the oil engine, filling in any deficiency that the latter may have in maintaining extremely low crank shaft speeds.

The second major function of the clutch, where Diesel engines with gear drive are used, is that of allowing the pinion with its slight mass moments to become an entirely separate entity with all the advantage of complete and yielding flexibility, with no thrashing possible even when receiving the most powerful torques. This makes comparatively inexpensive gears available, the clutches being low in cost and the efficiency exceedingly high. This reduces the oil-engined ship propelling equipment to a few rugged parts, giving reliable performance at very much higher efficiency than the electric drive with only a fraction of its cost and weight.

This electro-magnetic clutch, which will revolutionize methods of transmission of power, has three outstanding features.

(1) For the first time in engine-room practice, it affords complete torque-wise elasticity and freedom. This latter achievement is of far reaching significance inasmuch as it brings to the engine the possibility of complete freedom of design as to crank shaft speed by rendering gearing between a reciprocating engine and the tail shaft for the first time entirely practical and dependable. Also for the first time, outside of the full electric drive equipment, it is possible to eliminate the transmission of the large rotating moments of the engine without interfering with the transmission of useful torque. The torque, smoothed out completely and robbed of its heavy pulsations and irregularities, is thus passed on to the gear and tail shaft entirely free from concussion.

(2) Another outstanding feature of the clutch, never heretofore achieved, is the "squirrel cage secondary" operating through pure induction, which allows continuous slipping at any fractional rate, without excessive temperature rise. Thus the clutch supplements the engine completely at all fractional speeds below the stable operating speed of the engine.

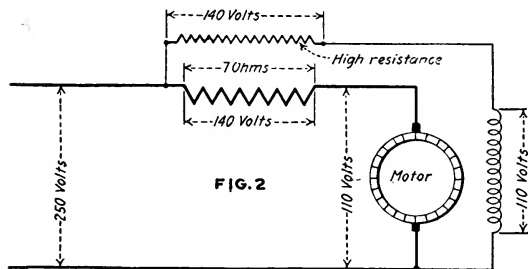
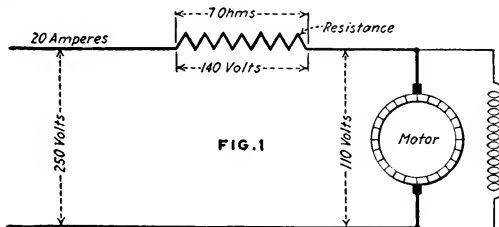
(3) The clutch operates as an automatic emergency disconnecting device, permitting the instant breaking away from the large mass moments of the engine and allowing the propeller to "stop in its tracks," whenever it encounters an obstacle whose resisting force exceeds the available maximum pull-out torque of the clutch.

This clutch has been developed and is manufactured by the Sperry Gyroscope Company of Brooklyn, New York.—*Nautical Gazette*, 26 November, 1921.

**EMPIRE AND POWER ALCOHOL.**—The Imperial Motor Transport Council of delegates from Empire governments has just held a conference under the auspices of the Empire Motor Fuels Committee. The discussion which took place turned mainly on the present position relating to customs and exercise restrictions and as to suitable methods of denaturation. The



Council, which includes representatives of British India, Australian Commonwealth, Union of South Africa, British Columbia, Quebec, and the Crown Colonies, decided to request the various governments concerned to take the necessary action in connection with the subjects mentioned in order to facilitate the production and distribution of industrial and power alcohol throughout the Empire. A recommendation was also made that each Empire government should consider the advisability of putting forward at a future conference proposals regarding the adoption of common methods of and formulæ for the denaturation of alcohol. It is hoped that the work of the Council will bear fruit. The need of doing everything



FIGS. 1 AND 2.—Diagram showing resistance connected in series with a motor.

possible to promote the use of Empire alcohol is quite obvious. The age of liquid fuel is being ushered in.—*The Engineer*, 11 November, 1921.

**OPERATING A DIRECT-CURRENT MOTOR ON INCREASED VOLTAGE.**—To take care of an emergency, it is sometimes necessary to operate a motor on a higher voltage circuit than the machine is rated for. Under such circumstances in order to reduce the voltage to the proper amount for the motor, a resistance box is placed in series with the machine. Suppose, for example, a motor rated 110 volts and 20 amperes, is to be operated on a 250-volt circuit. With the normal load on the motor and the voltage adjusted to 110 volts at the motor terminals, the voltage drop across the resistance box would have to be  $250 - 110 = 140$  volts. The resistance necessary for this condition would be  $\text{volts} \div \text{amperes} = 140 \div 20 = 7$  ohms. With normal load the line voltage would be divided into 140 volts across the resistance

box and 110 volts across the motor terminals, as indicated in Fig. 1. Inasmuch as the voltage drop across the resistance box varies directly with the current, it will be seen that any variation of current will change the applied voltage to the motor. This has the main objection of changing the field strength of the motor as well as causing a change in speed due to the change of voltage on the motor. For example, take the extreme condition that would be obtained at starting. Let it be assumed that the resistance of the armature for this particular motor is 0.5 ohm. The total resistance in the circuit is  $7 + 0.5 = 7.5$  ohms, and the starting current that would flow when the circuit was closed is  $\text{total volts} \div \text{total ohms} = 250 \div 7.5 = 33.4$  amperes. This value of current would give sufficient starting torque for ordinary cases provided the field had full strength. With 33.4 amperes flowing in the circuit, the voltage drop across the resistance box would be  $33.4 \times 7 = 233.8$  volts. This leaves  $250 - 233.8 = 16.2$  volts across the motor terminals, which would not give sufficient field strength to start the motor under any appreciable amount of load. To avoid this difficulty the field should be connected in series with a separate resistance box to the 250-volt circuit as in Fig. 2. The resistance value could then be adjusted to give normal field strength, which would remain constant regardless of the load conditions. The value of this resistance can be determined only after first measuring the field resistance. However, it will in all cases be of comparatively high value.

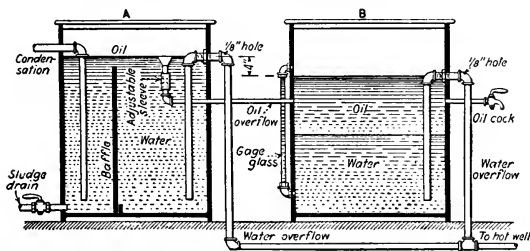
Disregarding the inefficiency of the scheme of using a resistance box in series with the armature for voltage control, there is an additional objection; namely, a change in speed if the load changes. Such a change would vary, depending on the character of the work the motor was doing. Under a condition of the load falling to such a value as to reduce the amperes to 10, then the voltage drop across the resistance box would be  $\text{amperes} \times \text{ohms} = 10 \times 7 = 70$  volts. The voltage on the motor is  $250 - 70 = 180$  volts. This might cause the speed to rise to an undesirable value. If the load was removed entirely, the no-load current would be approximately 5 per cent of the normal load current, or one ampere. The voltage drop across the resistance box would then fall to 7 volts, giving 241 volts on the motor. The rise in speed might be of such value as to produce dangerous mechanical stresses in the armature, or pulley, and the commutator might also arc over. Under such a condition it would be necessary to insert more resistance in the armature circuit. At no-load conditions the resistance would be equal to  $\text{volts drop across the resistance} \div \text{amperes} = 140 \div 1 = 140$  ohms. An adjusting feature would have to be provided in the resistance to change the values between 140 ohms and 7 ohms as the load came up to normal. This would require the constant attention of the operator, and in case of a belt flying off or breaking under full load the motor might be damaged before the operator could adjust the box. If the motor was connected by gears or direct-connected to a shaft driving a pump or similar load, then as the speed increased the load would increase also, which would tend to keep the speed from reaching an excessive value. The actual increase of speed in such a case would depend on the character of the work and would lessen to a certain extent the need of the operator's attention. Under such conditions it should be kept in mind that this arrangement is generally anything but satisfactory.—*Power*, 29 November, 1921.

**"TAMPA'S" REMARKABLE STOPPING ACCOMPLISHMENT.**—The United States Coast Guard cutter *Tampa*, first vessel of its kind to be electrically equipped throughout, has arrived at New York after a fast voyage from San Francisco via the Panama Canal. Captain W. J. Wheeler reported a remarkable accomplishment made by the *Tampa*. He said the ship had been brought from full speed ahead of 15 knots, to a dead stop in less than the length of the vessel. This is more than three times better than the record made by any previous cutter and was attributed to the ease of control made possible by the electric drive.

Steam-driven cutters have usually been brought to a standstill in not less than three boat lengths. This feature of quick stopping adds considerably to the maneuvering qualities of the ship and is a factor of much importance to revenue vessels.—*Nautical Gazette*, 19 November, 1921.

**EFFECT OF SHALLOW WATER ON SPEED OF SHIPS.**—During recent years, considerable attention has been paid to the effect of shallow water on the speed of ships, observes Mr. Harold E. Yarrow. In a fast vessel the wave-making resistance varies materially with the depth of the water through which she is moving. Formerly it was generally accepted that in shallow water the speed was reduced, but trials with a destroyer over a course where the depth of water varied demonstrated that this was not altogether true. This vessel was about 220 feet in length, having a displacement of 400 tons on a draught of approximately 6 feet.

When traveling at 30 knots it was found that the speed was unaffected, providing the depth of water was not less than 180 feet. In shallow water the resistance increased, as was expected, causing a corresponding decrease in speed, and at a depth of about 90 feet the speed was reduced considerably, while the wave at the stern was observed to be very high. When running,



DETAILS OF CONSTRUCTION OF HOME-MADE OIL SEPARATOR.

however, in still shallower water, with a depth of about 30 feet to 50 feet, the speed increased, and for the same horsepower it was between one and two knots higher than when the vessel was running in deep water; at the same time the stern wave had almost disappeared.

During these trials the inclination of the vessel varied considerably. When the stern wave was at its highest and the resistance at a maximum she settled down at the stern, and in shallow water, with very little stern wave, she approached an even keel. By means of various spirit levels suitably arranged to indicate the trim of the boat, it was found possible to ascertain approximately the depth of water in which the vessel was running.—*Nautical Gazette*, 19 November, 1921.

**HOME-MADE OIL SEPARATOR.**—In many plants there are a number of low-pressure traps discharging hot water heavily laden with oil. Usually, both the water and oil are wasted unless the installation is of sufficient size to justify the installation of a filter and purifier, in which case the heat in the water is recovered and the oil may be used again for certain purposes.

At small expense an oil separator can be made from two tanks or barrels and some pipe fittings, which will speedily pay for its cost in the saving of cylinder oil alone, besides adding materially to the hot-water supply.

Such an installation is shown. The operation is as follows: The oil-bearing hot water comes from the traps into the tank A, where some

separation takes place and the oil rises in the current of water and passes over the baffle. The funnel opening is just even with the water level in this tank, so that the agitation caused by the incoming water splashes the top layer of oil and water into the funnel and hence into the pipe leading to the storage tank *B*. The remainder of the water in tank *A* passes out through the siphon pipe from the bottom and carries no oil to the hotwell. A hole is drilled at the upper end of this pipe to prevent siphoning out too much of the water at once.

The oil overflow carries some water over into the tank *B*, where the oil remains in a strata at the top and the water passes out through a siphon pipe similar to that in tank *A*, but smaller. Both siphon pipes should be large enough so that at no time is it necessary for them to be more than half full.

The oil level should be watched in the glass and some drawn off before the gage fills; otherwise the action of the system is automatic. This salvaged oil is usually of good quality and may be used again for many lubricating purposes or even for steam-cylinder work if filtered.—*Power*, 15 November, 1921.

### NAVIGATION AND RADIO

**A NEW MAP OF UNIVERSAL INTEREST.**—A new base map of the North Pacific Ocean on the transverse polyconic projection has been prepared by W. E. Johnson, Cartographer of the U. S. Coast and Geodetic Survey of the Department of Commerce, and is now available for distribution. It is published in clear form and convenient size (dimensions 14 by 41 inches) for desk use. (Map No. 3080, North Pacific Ocean, scale 1:20,000,000, price 25 cents.)

This map is designed primarily as a base on which statistical data of various special kinds may be shown. In consequence of this purpose only features of major importance are shown on it and these features are emphasized to an extent not possible on a map which contains the vast amount of detail usually included.

In addition to the foregoing specific value, this map is of general interest at present as showing the relation between the United States, its possessions, and the Far East and as including those areas around which present problems in the North Pacific Ocean are centered.

This map represents the acme of scientific precision combined with simple practical utility. It extends from New York and Panama to Singapore and Calcutta, from Alaska and Siberia to the Hawaiian Islands and includes a part of South America and a portion of Australia. Through its lateral center it extends over 180°, or more than half way around the earth.

The distinctive feature of the map is that these localities are here pictured in practically their true relation as to distances, areas, and comparative angular direction of coast line. It will thus serve to correct the erroneous impression that we have all received from the usual representation of this region on Mercator charts and maps which greatly exaggerate areas and distances toward the poles when compared with their equatorial equivalents, and to the eye present the general continental coast lines out of their proper angular relation to one another. This is not a criticism of the Mercator projection for use in navigation, but merely of its use for purposes for which it is not adapted. In fact, if the Mercator projection were transversed just as the polyconic has been, the result would be only slightly different.

The problem of representing any considerable portion of the ellipsoidal form of the earth on a plane surface is not readily dealt with, or, in other words, is intractable. Always some desirable features must be sacrificed in order to incorporate those of primary value to the problem or area at hand. In the present instance, the property of true scale along a great circle tangent to the forty-fifty parallel of north latitude at the central

meridian of the map was chosen. This great circle is approximately the shortest distance between San Francisco and Manila, and in close proximity to it lie practically all the important points of interest, such as the Panama Canal, Mexico, our Pacific Coast, Alaska, the Philippine Islands, Japan, and the coast of China. This is accomplished through the use of the transverse polyconic projection, which is the regular polyconic or American projection turned from its normal vertical axis to a lateral great circle axis. This is an involved and laborious operation, but the resulting advantages are well worth while where areas of this nature are presented and accuracy is desired.

Both the vertical and lateral axes are straight lines, true to scale, and represent the shortest distance (great circle) between their extreme points. From these central lines the scale gradually expands toward the corners of the sheet where the maximum error occurs, thus quite a wide band of small scale error is preserved through the lateral center wherein lie the majority of the important cities, commercial areas and trade routes of this region.

This system of projection was devised by Ferdinand Hassler, who was the organizer and first superintendent of the oldest scientific government bureau, the U. S. Coast and Geodetic Survey. This projection was computed and constructed by C. H. Deetz, Cartographer, U. S. Coast and Geodetic Survey.—*Aerial Age Weekly*, 28 November, 1921.

**VARIATION OBSERVATIONS.**—The yacht *Carnegie*, making a magnetic survey of the earth for the Carnegie Institute of Washington, is now nearing the end of its 65,000-mile voyage. In addition to the survey for practical purposes, the staff of the yacht is making observations of a purely scientific nature. These observations include the measurement of the amount of electricity in the air and of the amount of radium in sea water. The whole study is in the field of terrestrial magnetism and the chief object is to determine as closely as possible the nature of magnetism, and how its effects and changes may be measured and predicted. The *Carnegie* is an entirely non-magnetic vessel, constructed and equipped with virtually no iron, steel or other magnetic substances. She is a sailing vessel having a small auxiliary engine capable of making four knots. The engine and galley stove are of brass and the anchors of bronze. In the building of the hull only locust spikes were used.—*Tech. Engineering News*, December, 1921.

**HIGH INTENSITY BEACON ON STATEN ISLAND.**—The Sperry Gyroscope Co. has erected a high intensity vertical beacon at Tompkinsville, Staten Island, about 100 feet in from the shore and 1000 feet eastwardly from the great Municipal Ferry Docks connecting with South Ferry, Manhattan. The light will be vertical over this spot, gradually waving between 10 and 15° each side of the vertical, making four beats a minute. The Lighthouse Commission is issuing a circular requesting observation on this beacon. Pilots of the U. S. Air Service are requested to make observation at the first opportunity and report to the Chief of Air Service as to the observation possible under the various weather conditions existing over Staten Island.—*Aviation*, 28 November, 1921.

**WIRELESS TELEGRAPH DEVELOPMENTS.**—It was a somewhat remarkable feat which was carried out from the new American wireless centre at New York a few days ago. The message sent out by the President of the United States expressing his hopes of continued peace throughout the world was received wherever suitable apparatus had been installed. The new radio centre on Long Island is the most important of the kind that has yet been constructed, and when the whole of the equipment is in place it should be possible to conduct simultaneous communication with five different parts of the world. Transmitting apparatus is to be provided for both Transatlantic and Transpacific ranges, and the equipment has

been designed to make provision for the inevitable development of Transatlantic wireless telephony. Important developments are also projected in Australia, where it is understood the government is likely to enter into an arrangement with the Amalgamated Wireless Company for the erection of a high-power station capable of direct communication with both the United Kingdom and America. The experimental stations of the company have been able to give direct communication with New York and European stations for some time past, but the new station would enable a regular commercial service to be provided. It is reported from Australia that the company named would probably operate the new station under government supervision, although the company would be quite prepared to finance and operate the station itself, or to sell its rights to the government.—*The Engineer*, 11 November, 1921.

**SIGNAL TO JAPAN.**—The American Navy's powerful radio station at Annapolis has been in direct communication with Japan, exchanging wireless signals with the powerful new Japanese station at Iwaki, 8000 miles distant. Annapolis had made many previous attempts to reach Iwaki and failed; and the connection this time was obtained accidentally. A naval operator, while calling San Diego, received a faint signal on San Diego's wave, but found it to be from the Japanese station. Naval experts were astounded that the connection had been made, and now attribute it to atmospheric conditions, since subsequent attempts to reach Iwaki have failed.—*Tech. Engineering News*, December, 1921.

### ORDNANCE

**THE BIGGEST BOMB IN THE WORLD.**—At the recent meeting of the Army Ordnance Association at Aberdeen Proving Ground an opportunity was afforded those present to see the latest development in aircraft bombs—the 4000-pound Demolition Bomb, probably the largest bomb in the world. It is doubtful, however, if many members of the association, not to mention the general public, whose impression has been gained in motion pictures, fully appreciate the great size or destructive power of this super bomb. It measures  $13\frac{1}{2}$  feet in height (from fins to nose). It is nearly 2 feet in diameter, and has an actual weight of about 4300 pounds, of which approximately 2000 pounds is high explosive. So far as is known, no other country has produced a similar weapon of such size.

It was designed by the Aircraft Armament Division in the Office of the Chief of Ordnance, for use by the largest bombing aircraft in the attack of naval vessels of the most modern battleship type and in raids against great munition plants. Careful consideration was given to all results obtained in previous experimental work, and in the design are embodied all the latest improvements. Although constructed to penetrate without deformation or fracture the usual targets against which it might be used, it is not constructed to go through heavy armor. In addition to being made strong enough to withstand impact, the case is proportioned to hold as much explosive as possible, for it is mainly upon the amount of explosive carried that the destructive effect of the bomb is dependent. Fuses in the nose and tail of the bomb have been designed to give either instantaneous action or delayed action, permissible delays ranging from a few hundredths of a second up to several seconds. Taken as a whole, the bomb may be considered the most powerful and efficient weapon of its type yet produced.

In the test the bomb was carried in the air by an American-made Handley-Page, and in order that the airplane might lift this great weight it was stripped of all its extra military load, the fuel tanks were but partly filled, and the pilot, bomber, and one mechanic were the only ones allowed to make the flight. Taking off with such a load was in

itself a dangerous venture, and added to this was the hitherto untried experiment of releasing so much weight at one time from an airplane. Capt. Norbert Carolin, the pilot; Sergt. Stewart Smink, the bomber; and Corp. Louis Averitt, the mechanician, deserve great credit for undertaking the initial flight with this bomb.

The observers witnessed the test from the main front of the Proving Ground, about 2000 yards from the point over which the bomb was dropped. As the airplane approached the bomb could be seen very clearly suspended in position under the fuselage, and when released it dropped in perfect flight, nosing down slowly with fins guiding it on its curved path through the air. Asked later concerning the effect of the release, the pilot stated that the airplane shot up about 20 feet, but this was no worse than a bad "bump," often encountered in flying.

When the bomb struck the ground, great masses of earth, debris, and smoke were hurled hundreds of feet in the air, and several seconds later came the tremendous crash of the detonation. A delay of a few hundredths of a second was used to allow the bomb to penetrate the ground to form a crater, thus limiting the distribution of fragments from the bomb case and eliminating the possibility of any one of these fragments being projected as far as the observing party, which might have occurred had an instantaneous fuse been used. The blast from the detonation was largely smothered by the formation of a crater, and some of the observers were disappointed that the effect from the detonation was not appreciably felt, but when the smoke and dust had cleared away the power of the bomb was shown by the immense crater formed. A hole 19 feet deep and 65 feet in diameter was blasted in the earth.—*Army Ordnance*, November, 1921.

**SPOTTING INSTRUMENTS.**—Orders have been received for the design and manufacture of two artillery spotting instruments for Coast Artillery and two similar instruments for Field Artillery, for test. These instruments will be designed for use by an airplane observer and will permit him to determine immediately and without any calculation, the distance of the fall of a shot from the target, as well as the mathematical bearing of the same relative to the target. This information will be sufficient to enable necessary corrections to be applied at the gun.—*Army Ordnance*, September-October, 1921.

**NEW ELECTRIC GUN.**—An electric cannon based on the fact that a conductor carrying a current will travel across a magnetic field has been developed by a Frenchman. A model of the gun has been built and gives a muzzle velocity of 200 meters per second to a 50-gram projectile. Since the gun windings are used but a fraction of a second, huge amounts of current can be employed. Further details can be found in the *Revue Generale de l'Electricité*.—*Tech. Engineering News*, December, 1921.

### MISCELLANEOUS

**WORLD'S FUTURE OILFIELDS ARE OF VAST AND INCALCULABLE EXTENT.**—In a paper on the future oilfields of the world read before the Institute of Marine Engineers, Mr. George Howell said that the vast regions in the environs of the Mackenzie River and other parts of the Dominion of Canada as well as Athabasca and Alberta were known to be more or less petroliferous and well worthy of more intense development. The oil is of a high grade paraffin base in certain regions and of an asphaltic base in others.

In the lower part of California new fields are being opened up every day. The Mid-Continent fields in North America are disclosing new oil sands; some have been discovered at a lower level than the deepest wells

sunk, while in certain other fields valuable intervening oil-containing sands have recently been discovered.

The whole of the northern portion of the Indian Empire is possible for new oil fields; the flanks alone of the Himalayas will afford much to interest the petroleum engineer. Burmah is only in its infancy as an oil producing region.

Afghanistan and Persia are countries practically unexplored in the geological sense for oil. The engineers of the Anglo-Persian Oil Co. have done much to add to our knowledge of future oil supplies, but, comparing the size of the region, the explored area is quite small to what will be disclosed when the more extensive examination of the ground has been undertaken. The south sections of the shore line of the Caspian Sea, particularly in the neighborhood of the Elburz mountains, travelling north-west by way of Enzali, give ample evidence over great tracts of country that they are of a petroliferous character.

Russia's oil futures are vast. Not more than 10 per cent of the petroliferous regions have been worked for oil. The Trans-Caspian provinces, the areas west of Baku, south of Grozni, as well as that in the vicinity of the Black Sea, offer also future fields for the supply of oil.

Additional oil fields are to be found in Colombia, Brazil, Venezuela, the Argentine, Ecuador, Chile, Uruguay, Paraguay, Peru and Guiana. The four first named countries offer substantial possibilities since they include areas in which both geological and structural conditions are suitable for oil accumulation.

If we were to take a retrospective view of the oil fields producing the 100,000,000 tons or more annually of petroleum products which are being consumed to-day, we should find that not more than 10 per cent of the total available supply has been extracted from them. Further, we should ascertain that as a matter of fact, a well drains only one-third of the potential supply, and that under certain conditions the greater part of the remaining two-thirds can be mined by shafts and galleries much in the same way as coal mining. In Pechelbronn, Alsace, from two to five times as much crude oil was extracted by mining in the manner indicated than had already been produced from the same bed by boring.—*Nautical Gazette*, 3 December, 1921.

EXPLOSION IN DUTCH VESSEL.—A serious explosion, due to an accumulation of gas, occurred November 9 in the Dutch submarine *K-4*, in Colombo harbor. The submarine was en route for the Dutch East Indies. Two of the crew were killed and one was injured.—*Naval and Military Record*, 16 November, 1921.

#### CURRENT NAVAL AND PROFESSIONAL PAPERS

A New System of Ship Construction. *The Shipbuilder*, October, 1921.

The Strategical Aspect of War Against Commerce. *Edinburgh Review*, October, 1921.

The Washington Conference and the Naval Issue. *Fortnightly Review*, November, 1921.

The Scope of Wind Tunnel Research. *Aerial Age Weekly*, 21 November, 1921.

The Several Efficiencies of the Steam Engine. *Power*, 22 November, 1921.

A Simple Method of Finding Steam Consumption of Small Turbines. *Power*, 6 December, 1921.

The Science of Electric Welding. *Journal of Franklin Institute*, November, 1921.

Fog Signalling by Means of Polarised Sound. *The Engineer*, 11 November, 1921.



# NOTES ON INTERNATIONAL AFFAIRS

FROM NOVEMBER 10 TO DECEMBER 10

PREPARED BY

PROFESSOR ALLAN WESTCOTT, U. S. Naval Academy

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## WORK OF WASHINGTON CONFERENCE

**NAVAL PROPOSALS.**—Under *Professional Notes* in this issue appears in full Secretary Hughes' proposal of November 12, for the cessation of naval construction for 10 years and the reduction of the United States, British, and Japanese navies on a ratio respectively of 5-5-3. On the basis of this plan the American navy would be reduced to 500,650 tons; the British, to 604,450 tons; and the Japanese to 299,700 tons. On the following day Mr. Balfour for Great Britain and Baron Kato for Japan signified "acceptance in principle" of this proposal. Mr. Balfour suggested two modifications: (1) That the submarine tonnage for each nation should be much further reduced and seagoing types for offensive warfare eliminated; (2) that replacement should be gradual year by year in order to maintain naval construction plants. Subsequently Japan urged that she be allowed a proportion of 7 to 10 instead of 6 to 10, and equal tonnage in airplane carriers. When this demand was resisted, she sought compensation in the form of assurances in the Far East. While the French and Italian navies were not at first considered, prospective difficulties appeared in view of the French demand for capital ship tonnage equal to that of Japan and submarine tonnage equal to that of Great Britain. It appeared that Italy would demand a navy equal to that of France, whereas Great Britain would oppose these increases at a time when her own navy was being reduced.

**FOUR-POWER AGREEMENT FOR PACIFIC ISLANDS.**—It was announced in a plenary session of the Washington Conference on December 10, that the following treaty had been agreed to by Great Britain, the United States, France, and Japan:

*Article I.*—The high contracting parties agree as between themselves to respect their rights in relation to their insular possessions and insular dominions in the regions of the Pacific Ocean.

If there should develop between any of the high contracting parties a controversy arising out of any Pacific question and involving their said rights which is not satisfactorily settled by diplomacy and is likely to affect the harmonious accord now happily existing between them, they shall invite the high contracting parties to a joint conference to which the whole subject will be referred for consideration and adjustment.

*Article II.*—If the said rights are threatened by the aggressive action of any other power the high contracting parties shall communicate with one

another fully and frankly in order to arrive at an understanding as to the most efficient measures to be taken, jointly and separately, to meet the exigencies of the situation.

*Article III.*—This agreement shall remain in force for 10 years from the time it shall take effect, and after the expiration of said period it shall continue to be in force subject to the right of any of the high contracting parties to terminate it upon 12 months' notice.

*Article IV.*—This agreement shall be ratified as soon as possible in accordance with the constitutional methods of the high contracting parties and shall take effect on the deposit of ratification, which shall take place at Washington, and thereupon the agreement between Great Britain and Japan, which was concluded at London on July 13, 1911, shall terminate.

### AGREEMENTS REGARDING CHINA

**PRINCIPLES ADOPTED BY POWERS.**—*The text of the agreement on general principles to be observed in the investigation regarding China, as subscribed to by the representatives of eight powers in the Committee on Pacific and Far Eastern Questions, was made public on Nov. 21, by Secretary Hughes. It was drafted by Elihu Root, discussed and amended. The text as adopted follows:*

It is the firm intention of the powers attending this conference herein-after mentioned, to wit, the United States of America, Belgium, the British Empire, France, Italy, Japan, the Netherlands and Portugal:

(1) To respect the sovereignty, the independence and the territorial and administrative integrity of China.

(2) To provide the fullest and most unembarrassed opportunity to China to develop and maintain for herself effective and stable government.

(3) To use their influence for the purpose of effectually establishing and maintaining the principle of equal opportunity for the commerce and industry of all nations throughout the territory of China.

(4) To refrain from taking advantage of the present conditions in order to seek special rights or privileges which would abridge the rights of the subjects or citizens of friendly states and from countenancing action inimical to the security of such states.

**CHINESE DEMANDS.**—At the opening sessions of the Conference Committee on Far Eastern Affairs the Chinese delegates proposed the following principles to be applied in the determination of questions relating to China:

"1. The powers engage to respect and observe the territorial integrity and political and administrative independence of the Chinese Republic. China upon her part is prepared to give an undertaking not to alienate or lease any portion of her territory or littoral to any power.

"2. China, being in full accord with the principle of the so-called open door or equal opportunity for the commerce and industry of all the nations having treaty relations with China is prepared to accept and apply it in all parts of the Chinese Republic without exception.

"3. With a view to strengthening mutual confidence and maintaining peace in the Pacific and the Far East, the powers agree not to conclude between themselves any treaty or agreement directly affecting China or the general peace in these regions without previously notifying China and giving to her an opportunity to participate.

"4. All special rights, privilege, immunities or commitments, whatever their character or contractual basis claimed by any of the powers in or relating to China are to be declared, and all such or future claims not so made known are to be deemed null and void. The rights, privileges, immunities and commitments now known or to be declared are to be examined with a view to determining their scope and validity, and, if valid,

to harmonizing them with one another and with the principles declared by this conference.

"5. Immediately or as soon as circumstances will permit, existing limitations upon China's political, jurisdictional and administrative freedom of action are to be removed.

"6. Reasonable, definite terms of duration are to be attached to China's present commitments which are without time limits.

"7. In the interpretation of instruments granting special rights or privileges, the well-established principle of construction that such grant shall be strictly construed in favor of the grantors is to be observed.

"8. China's rights as a neutral are to be fully respected in future wars to which she is not a party.

"9. Provision is to be made for the peaceful settlement of international disputes in the Pacific and the Far East.

"10. Provision is to be made for future conferences to be held from time to time for the discussion of international questions relative to the Pacific and the Far East, as a basis for the determination of common policies of the signatory powers in relation thereto."

**CONCESSIONS TO CHINA.**—The Conference Committee on Far Eastern Affairs took the following action in the course of committee meetings up to December 10:

*Alien Post Offices Withdrawn.*—On November 28, the committee adopted the following resolution:

Recognizing the justice of the desire expressed by the Chinese Government to secure the abolition of foreign postal agencies in China, save or except in leased territories or as otherwise specifically provided by treaty, it is resolved:

"1. The four powers having such postal agencies agree to their abandonment, subject to the following conditions:

"a. That an efficient Chinese postal service is maintained.

"b. That an assurance is given by the Chinese Government that they contemplate no change in the present postal administration so far as the status of the foreign Co-Director General is concerned.

"2. To enable China and the powers concerned to make the necessary dispositions, this arrangement shall come into force and effect not later than (January 1, 1923).

*Withdrawal of Foreign Troops Discussed.*—In the discussion of the withdrawal of foreign troops it was stated that there were about 5000 foreign troops in China exclusive of Manchuria and Shantung, including about 1500 American, 1000 British, 1200 French, and 1100 Japanese. Japan also had 2800 men in Shantung and her usual forces along the Manchurian railway. Japan declared that she could not consider the removal of these latter troops, since the whole question of Manchuria was determined by the Treaty of Peking in 1905. As regarded forces in China proper, she was willing to withdraw only when conditions warranted. No action was taken by the committee at this time.

*Committee to Investigate Judicial System.*—On November 29, the committee adopted a resolution to the effect that the powers were willing that political, jurisdictional, and administrative limitations upon China should be removed as soon as circumstances would permit; and that to this end a commission should be created to investigate China's judicial system and report within a year's time, each of the powers being then free to adopt or reject the committee's recommendations in whole or in part.

*China's Neutrality to be Respected.*—On December 7 a resolution was adopted, that "China's rights as a neutral are to be fully respected in future wars to which she is not a party." China had called attention to violations in the Russo-Japanese War and in the Japanese capture of Kiao-Chau.

*Wireless Stations.*—On December 7 it was agreed that legation wireless stations in China should send only official messages, and that China should be permitted to purchase all wireless stations established in her territory without her consent.

*Treaties to Respect Chinese Sovereignty.*—On December 8 the committee took up point 3 of the Chinese proposals to the effect that China should be notified of and allowed to participate in any treaty or agreement affecting her. After some discussion the following resolution was adopted:

That the powers attending this conference, hereinafter mentioned, to wit, the United States of America, Belgium, the British Empire, China, France, Italy, Japan, The Netherlands and Portugal declare that it is their intention not to enter into any treaty, agreement, arrangement or understanding, either with one another or individually or collectively with any power or powers, which would infringe or impair the principles which have been declared by the resolution adopted November 21 by this committee."

*Chinese Finances.*—The question of China's finances was referred to a sub-committee. China requested that she be allowed to raise to 12½ per cent the import tariff of 5 per cent to which she has been hitherto limited by international agreement. She also requested removal of the restrictions which required the deposit of most of her revenues in foreign banks, to insure payment on loans. Sir Robert Borden made the proposal that a duty of 7½ per cent *ad valorem* be permitted. Japan, however, objected to an immediate decision, declaring that the tariff question was too intricate for off-hand settlement, and pointing out that one third of her foreign trade was with China.

*Evacuation of Leased Territory.*—Regarding the evacuation of Chinese territory held by foreign powers, France made and later withdrew a conditional offer to give up the unimproved harbor on the coast of Kwangtung which she acquired in 1899. England offered to turn over Wei-hai-Wei, but insisted on the retention of the Kowloon territory as a protection for Hong Kong. Japan repeated her previous offers regarding Shantung, but indicated her intention to retain her holdings in Manchuria. The question of leased territories was left for further discussion.

*SEPARATE NEGOTIATIONS ON SHANTUNG.*—Acting upon the suggestion of the United States and Great Britain, Japan and China on November 30 agreed to begin direct conversations on the Shantung question, Secretary Hughes and Mr. Balfour offering their good offices in the effort to reach a solution. After meeting on the following day, the delegates of both powers issued statements presenting their respective views of the question. The Japanese statement read in part:

We are not unmindful of the difficulties with which the Chinese Government is being confronted in entering into direct negotiations on the subject.

We are, however, confident that, if approached from a broader perspective, the question should be susceptible of a speedy solution. The true and vital interests of the two nations are in no way conflicting.

It is unfortunate that the real issues involved have been very largely misunderstood in the popular mind. The term "Shantung Question" is itself a misnomer. The question is not one which affects the whole Province of Shantung. The important points now awaiting adjustment relate only to the manner of restoring to China an area of territory, less than one-half of 1 per cent of the Shantung Province, and also to the disposition of a railway 290 miles long, and its appurtenant mines, formerly under exclusive possession and management of the Germans. There is absolutely no question of full territorial sovereignty; that is being exercised by China throughout the length and breadth of the Province.

## GREAT BRITAIN

**FREE IRISH STATE.**—Following the refusal of the Ulster Government in November to accept union with Southern Ireland on the basis of an all-Ireland Parliament and other terms proposed by the Sinn Fein, the British Government renewed its efforts to secure modified terms from the Sinn Fein delegates in London. On December 6 an agreement was reached, signed, and published, to go into effect in Southern Ireland upon ratification by the British and by the Southern Irish parliaments. These parliaments were at once called into special session for the purpose of considering the treaty. The Irish Cabinet disagreed over its adoption, Mr. de Valera and two other members declaring themselves opposed.

Unless the Ulster Government makes objection within a month's time, the agreement would also go into effect for Northern Ireland. But the latter retained the right to remain a separate government under the terms of the Government of Ireland Act of 1921, and it appeared likely that this would be Ulster's choice. The text of the treaty follows:

*Article I.*—Ireland shall have the same constitutional status in the community of nations known as the British Empire as the Dominion of Canada, the Commonwealth of Australia, the Dominion of New Zealand and the Union of South Africa, with a Parliament having powers to make laws for peace and order and good government in Ireland, and an executive responsible to that Parliament, and shall be styled and known as the Irish Free State.

*Article II.*—Subject to provisions hereinafter set out, the position of the Irish Free State in relation to the Imperial Parliament, the Government and otherwise shall be that of the Dominion of Canada, and the law, practice and constitutional usage governing the relationship of the Crown or representative of the Crown and the Imperial Parliament to the Dominion of Canada shall govern their relationship to the Irish Free State.

*Article III.*—A representative of the Crown in Ireland shall be appointed in like manner as the Governor General of Canada and in accordance with the practice observed in making such appointments.

*Article IV.*—The oath to be taken by the members of the Parliament of the Irish Free State shall be in the following form:

"I do solemnly swear true faith and allegiance to the Constitution of the Irish Free State as by law established, and that I will be faithful to his Majesty King George V, and his heirs and successors by law, in virtue of the common citizenship of Ireland with Great Britain and her adherence to and membership of the group of nations forming the British Commonwealth of Nations."

*Article V.*—The Irish Free State shall assume liability for service of the public debt of the United Kingdom as existing at the date thereof and toward the payment of war pensions as existing on that date in such proportion as may be fair and equitable, having regard for any just claims on the part of Ireland by way of set-off or counter-claim, the amount of such sums being determined, in default of agreement, by the arbitration of one or more independent persons being citizens of the British Empire.

*Article VI.*—Until an arrangement has been made between the British and Irish Governments whereby the Irish Free State undertakes her own coastal defense, defense by sea of Great Britain and Ireland shall be undertaken by his Majesty's imperial forces, but this shall not prevent the construction or maintenance by the Government of the Irish Free State of such vessels as are necessary for the protection of the revenue or the fisheries. The foregoing provisions of this article shall be reviewed at a conference of representatives of the British and Irish Governments to be held at the expiration of five years from the date hereof with a view to the undertaking by Ireland of a share in her own coastal defense.

*Article VII.*—The Government of the Irish Free State shall afford to his Majesty's imperial force (a) in time of peace such harbor and other facilities as are indicated in the annex hereto, or such other facilities as may from time to time be agreed between the British Government and the Government of the Irish Free State, and (b) in time of war or of strained relations with a foreign power such harbor and other facilities as the British Government may require for the purposes of such defense, as aforesaid.

*Article VIII.*—With a view to securing observance of the principle of international limitation of armaments, if the Government of the Irish Free State establishes and maintains a military defense force, the establishment thereof shall not exceed in size such proportion of the military establishments maintained in Great Britain as that which the population of Ireland bears to the population of Great Britain.

*Article IX.*—The ports of Great Britain and the Irish Free State shall be freely open to the ships of the other country on the payment of the customary port and other dues.

*Article X.*—[This merely provides compensation by Great Britain or Ireland for discharged officials and constabulary.]

*Article XI.*—Until the expiration of one month from the passing of the Act of Parliament for the ratification of this instrument, the powers of the Parliament and Government of the Irish Free State shall not be exercisable as respects Northern Ireland, and the provisions of the Government of Ireland Act of 1920 shall, so far as they relate to Northern Ireland, remain of full force and effect, and no election shall be held for the return of members to serve in the Parliament of the Irish Free State for the constituencies of Northern Ireland unless a resolution is passed by both houses of Parliament of Northern Ireland in favor of holding such elections before the end of the said month.

*Article XII.*—If before the expiration of said month an address is presented to his Majesty by both houses of Parliament of Northern Ireland to that effect, the powers of the Parliament and Government of the Irish Free State shall no longer extend to Northern Ireland, and the provisions of the Government of Ireland Act of 1920 (including those relating to the Council of Ireland) shall, so far as they relate to Northern Ireland, continue to be of full force and effect, and this instrument shall have effect, subject to the necessary modifications;

Provided, that if such an address is so presented, a commission consisting of three persons, one to be appointed by the Government of the Irish Free State, one to be appointed by the Government of Northern Ireland, and one, who shall be chairman, to be appointed by the British

Government, shall determine in accordance with the wishes of the inhabitants, so far as may be compatible with economic and geographic conditions, the boundaries between Northern Ireland and the rest of Ireland, and for the purposes of the Government of Ireland Act of 1920, and of this instrument the boundary of Northern Ireland shall be such as may be determined by such commission.

*Article XIII.*—For the purpose of the last foregoing article the powers of the Parliament of Southern Ireland under the Government of Ireland Act of 1920, to elect members of the Council of Ireland, shall after the Parliament of the Irish Free State is constituted, be exercised by that Parliament.

*Article XIV.*—After the expiration of said month, if no such address as mentioned in Article XII, hereof is presented, the Parliament of the Government of Northern Ireland shall continue to exercise as respects Northern Ireland the powers conferred upon them by the Government of Ireland Act of 1920, but the Parliament of the Government of the Irish Free State shall in Northern Ireland have in relation to matters, in respect of which the Parliament of Northern Ireland has not the power to make laws under that act (including matters which, under said act, are within the jurisdiction of the Council of Ireland), the same powers as in the rest of Ireland, subject to such other provisions as may be agreed to in the manner hereinafter appearing.

*Article XV.*—At any time after the date hereof the Government of Northern Ireland and the Provisional Government of Southern Ireland, hereinafter constituted, may meet for the purpose of discussing provisions, subject to which the last of the foregoing article is to operate in the event of no such address as is therein mentioned being presented, and those provisions may include: (a) Safeguards with regard to patronage in Northern Ireland; (b) safeguards with regard to the collection of revenue in Northern Ireland; (c) safeguards with regard to import and export duties affecting the trade and industry of Northern Ireland; (d) safeguards for the minorities in Northern Ireland; (e) settlement of financial relations between Northern Ireland and the Irish Free State; (f) establishment and powers of a local militia in Northern Ireland and the relation of the defense forces of the Irish Free State and of Northern Ireland, respectively, and if at any such meeting provisions are agreed to the same shall have effect as if they were included among the provisions subject to which the powers of Parliament and of the Government of the Irish Free State are to be exercisable in Northern Ireland under Article XIV, hereof.

*Article XVI.*—Neither the Parliament of the Irish Free State nor the Parliament of Southern Ireland shall make any law so as either directly or indirectly to endow any religion, or prohibit or restrict the free exercise thereof, or give any preference or impose any disability on the account of religious belief or religious status, or affect prejudicially the right of any child to attend school receiving public money without attending the religious instruction of the school, or make any discrimination as respects state aid between schools under the management of the different religious denominations, or divert from any religious denomination or any educational institution any of its property except for public utility purposes and on the payment of compensation.

*Article XVII.*—By way of provisional arrangement for the administration of Southern Ireland during the interval which must elapse between the date hereof and the constitution of a Parliament and a Government of the Irish Free State in accordance therewith, steps shall be taken forthwith for summoning a meeting of the members of Parliament elected for the constituencies in Southern Ireland since the passing of the Government of Ireland Act in 1920 and for constituting a provisional government. And the British Government shall take steps necessary to transfer to such provisional government the powers and machinery requisite for the dis-

charge of its duties, provided that every member of such provisional government shall have signified in writing his or her acceptance of this instrument. But this arrangement shall not continue in force beyond the expiration of twelve months from the date hereof.

*Article XVIII.*—This instrument shall be submitted forthwith by his Majesty's government for the approval of Parliament and by the Irish signatories to a meeting summoned for the purpose of members elected to sit in the House of Commons of Southern Ireland, and, if approved, it shall be ratified by the necessary legislation.

Signed on behalf of the British delegation: *Lloyd George, Austen Chamberlain, Birkenhead, Winston Churchill, Worthington-Evans, Hamar Greenwood, Gordon Hewart.*

On behalf of the Irish delegation: *Art of Griobhtha (Arthur Griffith), Michael O. O. Sileain (Michael Collins), Riobard Bartun (Robert C. Barton), E. S. Dugan (Eamon J. Duggan), Seorsa Ghabgain Uí Dhubh-thaigh (George Gavan Duffy).*

Dated the 6th of December, 1921.

### ANNEX

An annex is attached to the treaty. Clause 1 specifies that Admiralty property and rights at the dockyard port of Bellehaven are to be retained as at present date and the harbor defenses and facilities for coastal defense by air at Queenstown, Belfast, Lough and Loughswilly to remain under British care, provision also being made for oil, fuel and storage.

Clause 2 provides that a convention shall be made between the two governments, to give effect to the following conditions: That submarine cables shall not be landed or wireless stations for communication with places outside of Ireland established, except by agreement with the British Government, that existing cable rights and wireless concessions shall not be withdrawn except by agreement with the British Government, and that the British Government shall be entitled to land additional submarine cables or establish additional wireless stations for communication with places outside of Ireland, that lighthouses, buoys, beacons, etc., shall be maintained by the Irish Government and not be removed or added to except by agreement with the British Government, that war signal stations shall be closed down and left in charge of care and maintenance parties, the government of the Irish Free State being offered the option of taking them over and working them for commercial purposes, subject to Admiralty inspection, and guaranteeing the upkeep of existing telegraphic communication therewith.

Clause 3 provides that a convention shall be made between the two governments for the regulation of civil communication by air.

**EGYPT OBJECTS TO BRITISH TERMS.**—Negotiations in London for the freeing of Egypt along the lines suggested by the Milner Commission, were held up by the refusal of the Egyptian Premier, Sir Adly Yeghen Pasha, to accept the British proposals. The objections were chiefly: (1) That Egypt was not permitted to enter into agreement with foreign nations without British approval; (2) that British troops were not to be confined to the zone of the Suez Canal.

In his report of the negotiations, published in November, the British High Commissioner, Lord Allenby, called attention to the great importance of Egypt on the main line of communications with the East. The immunity of Egypt from the dominant influence of any other great power he there-



fore declared to be of primary importance to India, Australia, New Zealand, and all other British eastern colonies, affecting the safety of nearly 350,000,000 British subjects.

ANGLO-AFGHAN TREATY.—Negotiations by Sir Henry Dobbs in Kabul, which had continued since January, 1921, were concluded in November by a treaty, signed but not finally ratified, covering the following points:

(1) Britain recognizes the complete independence of Afghanistan. (2) Both countries accept the existing Anglo-Afghan frontiers, and each agrees to notify the other before entering upon military operations necessary for maintaining order among border tribes. (3) There is no mention of the former British subsidy to the Ameer of Afghanistan, but Afghanistan is given the privilege of importing arms and munitions through India without duties or other hindrance. (4) Russian consulates are abolished in the three Afghan districts on the India frontier.

The last point will in some measure protect India against Soviet intrigue, though the Soviet mission remains at Kabul and the Russian subsidy is presumably continued. Together with the recantation of Mahatma Gandhi, the Indian agitator, and the visit of the Prince of Wales, the Afghan pact is expected to lighten British problems in India.

LORD NORTHCLIFFE ON AUSTRALIA'S DANGERS.—"One can almost smell the East on your northern winds, and yet I have met scarcely a score of men and women in Australia with any sense of the imminent danger in which their country stands," declared Lord Northcliffe, the English newspaper owner, in an interview given to the daily press before his departure from Australia. He warned Australia that only numbers could save her.

"This great empty continent is set in a world which (natural) science and engineering make every day smaller. Australia's magnitude and riches and the weakness of its garrison are known to all the overcrowded, ambitious nations in the near north. Probably governments which circumstance may one day make hostile to the Commonwealth, know more about the possibilities of this country as a home for scores of millions of people than is known by most Australians. Australians do not seem properly awake to the fact that they live in an age which has lately proved itself to be not distinguished by respect for international rights. To-day moral right to territory is in itself no right at all. Moral right must be based upon capacity in arms. Among people of relatively equal individual fighting strength, capacity in arms is measured by numbers, and by this standard Australia's present position and immediate future are precarious.

"I am deeply impressed by your magnificent natural riches," continued Lord Northcliffe, "but I leave lovely Australia haunted and saddened by thoughts of your weakness. I am amazed at your indifference to events and portents in the outside world and especially in Asia. Within a fortnight's steam of your Commonwealth you have thousands of millions of people, all of whom are crowded and restless and some of whom are ambitious and powerful. Yet you go about your work and play as though lust for territory had not all down the centuries been the cause of war, and as though the history of the world had not been the story of the overthrow of the weak by the strong."

"The key to your White Australia ideal—the sure parent of all your ideals—is population. You must increase your slender garrison by the multiplication of your people. Only numbers will save you. The world

will not tolerate an empty and idle Australia. This continent must, like the other continents, carry its full quota of people and do its full share of production. You must take immigrants—the right kind of immigrants, immigrants not for the towns, but for the empty spaces. You have no option. Tens of millions will come to you whether you wish it or not. You cannot hold up a human flood by a restriction clause in an act of Parliament."

On the one hand there was "the one sure parent of all the future greatness of Australia," immigration, almost entirely neglected; on the other hand the public mind was filled with the proposed convention to consider amendments to the Constitution, with the standardization of the railway gauge, improved communications, the revision of the tariff, a basic wage, fair prices courts, the promotion of state lotteries, and the control of pedestrian traffic in the streets. A bold, constructive immigration policy, establishing within two or three years a flow of at least 100,000 people a year to the Commonwealth, with a rapid increase to 250,000, was urged by Lord Northcliffe, who said that the outstanding facts to-day were: Australia must have the people; the people are available: Australia can absorb and prosper them, and their coming will profit all classes in the country. Immigration was a "nightmare to public men in Australia" only because it was being conducted on tinkering feeble lines.

"What is clearly and urgently needed," Lord Northcliffe sums up, "is a great development scheme, which will insure over, say 25 years:

- "1. More work than can be done by workers already in Australia;
- "2. More land available for settlement by new farmers than can be taken up by land seekers already in Australia;
- "3. Greatly increased production, which will mean more work, more prosperity."

## GERMANY

REPARATIONS DISCUSSIONS IN LONDON.—The Allied Reparations Commission in November sent a note to the German Government requesting that measures be taken at once to assure the reparations payments due in January and February.

Following the much-discussed visit to London of the German financier Stinnes, the former German Reconstruction Minister Herr Rathenau spent several days there in December. It was stated that he had gained no material concessions regarding reparations, but had paved the way for the resumption of banking transactions between England and Germany. A meeting of Allied Premiers for consideration of the reparations question was planned for the near future.

JANUARY PAYMENTS ASSURED.—Berlin, December 9.—Germany's reparation riddle is nearing a solution. It is certain tonight that Germany can and will meet the next reparation payment of 500,000,000 gold marks on January 15. Thereby a new factor of stability will have been injected into the critical financial situation.

Germany is still short 270,000,000 gold marks to make up the 500,000,000 of the January quota. In other words the Reichsbank has in hand approximately 230,000,000 gold marks worth of dollars and other foreign exchange available for turning over to the Allies. The Reichsbank must now scratch around to try to raise the balance of 270,000,000 gold marks by January 14, but if the worst came to worst, the Reichsbank could still tap its gold reserve to make the January reparation payments which is thus assured,

even if Germany is unsuccessful in floating loans between now and January 15.

While the centre of gravity in the reparation problem still lies in Paris important decisions are shaping here. There is an absolute determination not to fall down on the January and February payments, the determination being inspired by a wholesome fear that the French would seize the opportunity offered by default to occupy the Ruhr region.—*N. Y. Times*, 10/12.

### BALKANS AND NEAR EAST

**PROTECTION FOR ALBANIA.**—At the request of Great Britain, the hostilities along the Albanian frontier between Albanian and Yugoslavia were taken up by the Council of the League of Nations as a menace to international peace. At the hearing representatives of both nations pledged their governments to accept and respect the frontier laid down by the Allied Powers. A protocol to this effect was signed on November 18.

**BRITISH OBJECT TO FRANCO-TURKISH PACT.**—During November there was further exchange of notes between France and Great Britain regarding the agreement between France and the Turkish Nationalists. The French evacuation of Cilicia, provided for in this agreement, not only opened the right flank of the Greek army to Turkish attack and turned over to the Turks the French matériel and munitions, but also placed the Armenians and Greek Christians of the district at the mercy of the Turks.

In a note dated November 29, the British Government made inquiries regarding the provisions made for protection of minorities in the territory surrendered by France, and signified its intention to send a naval vessel to Mersina for the protection of British residents. Following the interchange of notes there was a prospect that the Near Eastern question would again be taken up by the Allied Powers, with the object of mediating between Greeks and Turks and reaching a general settlement in Asia Minor.

### RUSSIA

**FRANCE AGAINST RELATIONS WITH SOVIETS.**—Paris, France, November 23.—A French note has been sent to London on the subject of Russian pre-war debts. It recalls that France has already explained why it appears to her vain and dangerous to renew relations, even economic, with the Bolsheviki. This attitude is in conformity with that of America as defined in January, 1921.

In Mr. Tchitcherin's note, the recognition of debts is taken as a basis for bargaining and France refuses to admit such a proceeding. Moreover, Mr. Tchitcherin does not speak of war debts, nor of loans to societies whose possessions the Soviets have confiscated. Fundamental guarantees which would justify any kind of recognition of the Moscow Government, are not furnished. Only when they are, can France examine the possibility of pourparlers.—*Chris. Sci. Monitor*, 23/11.

**ALAND ISLANDS DECISION PROTESTED.**—Stockholm, Sweden, Nov. 22.—George Tchitcherin, the Soviet Foreign Minister, has addressed a note to Hjalmar Branting, the Swedish Premier, stating that the Soviet Government cannot recognize the agreement of October 20, regarding the

Aland Islands as, owing to the importance of the islands to Russia on account of their geographical position, no change in their juridical status can be countenanced.

The note continues that the action of the Swedish Government in taking part in said agreement will be considered a hostile action against Russia's interests.

### JAPAN AND FAR EAST

CHANGES IN GOVERNMENT.—On November 12 Baron Koreldyo Takahashi, Minister of Finance in the Hara Cabinet, was named premier to succeed former Premier Hara. Baron Takahashi was a close friend and political adherent of his predecessor, and is one of Japan's most prominent financiers. There were no other cabinet changes, Baron Takahashi retaining his post as Minister of Finance, Uchida of Foreign Affairs, and Kato of the Marine.

On November 25 the Emperor Yoshito of Japan withdrew from official duties owing to protracted illness, and named Crown Prince Hirohito to assume the duties of regent.

JAPAN AND FAR EASTERN REPUBLIC.—Peking, China.—The conference now in session at Dairen between representatives of Japan and of the Chita Government attracts more public interest here than the previous negotiations between Mr. Yourin and the Chinese Foreign Office. It has become known that the most delicate point in the negotiations is the question of the Japanese occupation of Northern Saghalien. Japan bases her extensive occupation of the northern portion of this land upon military necessity growing out of the Nikolaivsk incident. It is understood that the Chita representative is insisting that Japanese occupation preceded that incident and that after it the Japanese extended their authority and seized other valuable assets.

As a matter of fact the wholesale massacre of the Japanese garrison at Nikolaivsk in the spring of 1920 was carried out by an irresponsible mob of aggrieved Russians who found their means of livelihood threatened by the Japanese occupation of the valuable fisheries at the mouth of the Amur river, where Nikolaivsk is located, as well as by the Japanese seizure of all the fishery rights north of Vladivostok.

It is known here that it was not until after the incident that formal possession was taken although previous to it the Japanese had assumed the rôle of domination. The formal declaration of seizure was followed by the setting up of a Japanese municipality, the changing of the names of the streets to Japanese names, the exploitation of mines and forests and the importation of such a large number of Japanese workmen that it resulted in a congestion of labor. At the time of the occupation Japan announced that its object was to hold the area until Japan's honor and dignity could be satisfied by satisfactory settlement of the Nikolaivsk affair.

When the Chita Government asked that the Japanese troops should be withdrawn from Siberia as a preliminary to the signing of a trade agreement, Japan hesitated to act under a poorly concealed threat. It countered the claim by insisting that the Chita Government should render satisfaction to Japan for the Nikolaivsk incident but Chita replied that its government was not in existence at the time of the Nikolaivsk massacre and that it could not therefore be held responsible for incidents which occurred before its organization. Chita further stated that under no circumstances can consent be given to the occupation or annexation of Russian soil by Japan.—*Christian Science Monitor*, 25/11.

## LATIN AMERICA

GUATEMALA REVOLUTION.—Guatemala City, Guatemala, Dec. 8 (Associated Press).—General Orellana, Chief of Staff of the Guatemalan Army, to-day was elected Provisional President of the Republic to take the place of Carlos Herrera, who was overthrown early in the week.

The National Assembly convened this afternoon, despite the protest of Representative Silva Pera against the constitutionality of such action.

The French, Spanish and Mexican Ministers to-day paid a visit to the de facto Government officials. They then visited former President Herrera and former Minister of Foreign Affairs Luis Aguirre, who are under detention. The de facto Government has promised to treat the prisoners with every consideration and to accord them judicial trials.

Benton McMillin, the American Minister, in an interview to-day, declared that he had declined to join the other ministers in their visit to the de facto government. He added that, according to custom, he would take no steps of any kind toward the de facto Government that might be construed as recognition of it until he was instructed so to do by the government at Washington.

Twenty-five persons were killed inside the city on Tuesday morning during the overthrow of the government. According to an official report, ten of the killed were city police.



## REVIEW OF BOOKS

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"Universe." By Scudder Klyce. \$2.00 plus postage. (Printed and published by S. Klyce, Winchester, Mass.)

The advertisement of this book as "a verifiable solution of the "Riddle of the Universe" is not written with the same rigorous explicitness that characterizes the book itself.

What is the "Riddle of the Universe"? The great majority would unhesitatingly say that "riddle" should be plural as there are many riddles which intelligent human beings are attempting to solve with more or less success each day.

With hesitation the writer submits that the riddle which the author had in mind was the distinction which exists in its utmost plenitude in all knowledge; i. e., the distinction between the knowledge of an individual acquired from his experience and its valid expression as (common) knowledge.

All men acquire knowledge to a greater or less degree based on their experience. To make this knowledge available to others or to record it for their own future use, requires that they express it or record it in some manner. In so far as they approach absolutely exact and consistent expression, their knowledge becomes universal; and in so far as they fail, others are confounded and confused with variations which they cannot correlate. To so express knowledge that another, familiar with your expression, will get your exact ideas, is one of the most, if not the most, difficult arts in the world.

To summarize the "Universe" of (325,000 words) in a short review is impossible. The best that can be done is to touch on a few features of common interest.

It is always of interest in the consideration of a book of this type to know why it was written. How was the attention of the author first drawn to his subject? Why did the author devote years of labor and study to writing such a book?

Here is the author's statement as given in an interview published in the *Public Ledger* of Philadelphia on 30 November:

"I started out on the study that led to the book because it angered me in school not to understand things. There were many things I wanted to know that no one would explain and so when I was writing the book I hoped it might explain some of those things that made me so indignant and impatient. Now I am interested in seeing what happens, whether any of the experts will go for me. There is a heavy responsibility in having no one to edit your work. Perhaps I have made errors. And certainly

my unifications of knowledge cannot be final. But it will be interesting to see what my book does."

From this statement it appears that the author found that in acquiring knowledge he frequently could not understand its expression. And, since there was in certain fields of knowledge, uniform expression, the legitimate conclusion which the author reached and which appears to be in accordance with "common sense" was that the method of expression itself was faulty, and it was with this idea that the "Universe" was written.

A comparison of the author's experience, with previous experience along similar lines, would be interesting. "The Epistle to the Reader" in Locke's "Essay on the Human Understanding" reads as follows:

"Were it fit to trouble thee with the history of this Essay, I should tell thee, that five or six friends, meeting at my chamber, and discoursing on a subject very remote from this, found themselves quickly at a stand by the difficulties that rose on every side. After we had awhile puzzled ourselves, without coming any nearer a resolution of those doubts which perplexed us, it came into my thoughts, that we took a wrong course; and that, before we set ourselves upon inquiries of that nature, it was necessary to examine our own abilities, and see what objects our understandings were not fitted to deal with. This I proposed to the company, who all readily assented; and thereupon it was agreed, that this should be our first inquiry.

"The commonwealth of learning is not at this time without master-builders, whose mighty designs in advancing that science will leave lasting monuments to the admiration of posterity: But every one must not hope to be a Boyle or a Sydenham; and in an age that produces such masters as the great Huygenius, and the incomparable Mr. Newton, with some other of that strain, it is ambition enough to be employed as an under-labourer in clearing the ground a little, and removing some of the rubbish that lies in the way to knowledge; which certainly had been very much more advanced in the world, if the endeavours of ingenious and industrious men had not been much cumbered with the learned but frivolous use of uncouth, affected, or unintelligible terms introduced into sciences, and there made an art of to that degree, that philosophy, which is nothing but the true knowledge of things, was thought unfit or incapable to be brought into well-bred company and polite conversation.

"I know there are not words enough in any language to answer all the variety of ideas that enter into men's discourses and reasonings. But this hinders not but that when any one uses any terms, he may have in his mind a determined idea which he makes it the sign of, and to which he should keep it steadily annexed during that present discourse. Where he does not or cannot do this, he in vain pretends to clear or distinct ideas; it is plain his are not so; and therefore there can be expected nothing but obscurity and confusion, where such terms are made use of which have not such a precise determination."

It would be interesting to know who the five or six friends were who met with Locke and were responsible, in part, for his essay. We know that Locke was more or less intimate with Wren, Hooke, Boyle, Huygens,



Desaguilers, and last but not least, Sir Isaac Newton himself. If such a company had difficulty in discussion it is apparent that the art of expression is most difficult.

Knowledge is a record of experience or experiments. As an individual is an accurate, exact observer and experimenter, his knowledge (un-expressed but recorded in his mind) is exact and accurate. When knowledge is expressed by individuals, using words and symbols, common to all and consistent with themselves, knowledge is universal. Faulty expression results in confusion. A real unification of knowledge is impossible without a rigorous, exact and common method of expression.

Mr. Klyce makes the theory of language or formal unification, Part I of this book.

We may be pardoned for quoting a few paragraphs which "express all the real argument of this book" as follows:

"SEC. 12. (c) So we start with merely the general form of statement, in an abbreviated form:  $2 + 3 = 5$ . In the first member of that, we have *two parts*, '2' and '3.' *I. e.*, the first member implicitly asserts that there are *two* collections of things, which collections are at least *verbally separate*. The last member implicitly asserts that there are *not* two collections of things, but that there is one collection *not* verbally separate. In short, so far as *form or language* is concerned, the last member *formally contradicts the first*. Hence, in our typical sentence, we say a thing is so; and then promptly, and as a part of the very same sentence, say it is not so.

"(d) Well; by all conventional views of logic or 'reason' our typical sentence is thus verbally or formally positively and completely illogical and irrational, as it says one thing and then at once says it is not true—as it flatly contradicts itself. But by ordinary commonsense—by direct observation or experience—we know that the typical sentence is correct or true. In fact, a proverbial symbol for obvious truth is the statement  $2 + 2 = 4$ ; and I should have used that, except we needed to distinguish one 2 from the other 2, and it is hence rhetorically less awkward, to use  $2 + 3$ .

"(e) Therefore, we simply use observation or 'common-sense,' and conclude that orthodox logic or reasoning is wrong, because  $2 + 3 = 5$  is correct. Then we further conclude, as being the total essential of a valid logic, that in any sentence—*i. e.*, completely stated and *intelligible* sentence—which is not a truism of the form  $A = A$ , we *must* have a formal or verbal 'contradiction,' in the respect that *parts* are asserted both to be *parts* and *also* to be combined into a *whole* which is not *parts*. In fact, we may readily see that to make such a 'contradiction' is the whole purpose and use of language:—to combine parts into a whole: to make names of parts coalesce into a formal unit that *means* the whole. That states the essential of language and the whole verbal trick. We apply that trick and thus unify knowledge, by adhering to the simple rule:—make sure that the valid—or 'rational,' or 'true'—sentence does contain such a formal contradiction; if it does not, and is not a truism, it is really nonsense.

SEC. 13. (a) That is the sum total of the essentials of valid logic, and it implicitly contains the solutions of all qualitative problems. The last three paragraphs express all the real argument of this book, and there is nothing in all of knowledge any more difficult to understand than those simple observations. The reader knows that logic already. He uses it daily, as 'commonsense,' without even having to 'think' about it. He is so expert at it that he would find difficulty in saying how he does it, just as he would find (perhaps much less) difficulty in stating precisely what motions he makes in putting on his clothing. Below in this book I merely point out the details of that familiar logic, and the reader verifies them by his own observation and discovers that he knows all answers to questions of principle."

To the reviewer a unit of knowledge is an idea. A unit of language is a word, or a symbol, or any combination of these units used in expressing an idea. Now when an individual wishes to visibly or orally express an idea in language he must use units of language, which *per se* must express common knowledge (common ideas). He may do it consciously with rigorous exactness or he may unconsciously consider the knowledge or environment of the recipient and omit certain parts (of a completely stated, intelligible idea) as being known to the recipient. However, the new idea is the One idea or, the one, made up of common ideas or parts, the Many, and the relationship between the parts.

Valid logic, or expression is to go from the known to the unknown: From the parts or the many ideas (common knowledge) and their relationship (known or accepted) to the one idea (known to the teacher). This is the unification of knowledge.

The expression of knowledge in valid logic is a step by step process. At no time in the process must contact with the parts and relationships, *i. e.* (common knowledge) of the recipient or recipients be lost. If such contact is lost it will be found that "commonsense" is also lost or missing or unavailable. The result being that that expression of knowledge is unintelligible in so far as the recipient is concerned, *i. e.* (the expression is nonsense).

From this it follows that every new idea (completely expressed and intelligible) must consist of at least two factors (common ideas) and a relationship. The valid expression so constructed, expresses the new idea in understandable language to all individuals who are familiar with the factors (common idea) and the relationship. This is the understanding the reviewer has of what the author calls the sum total of the essentials of valid logic.

Only such persons as are familiar with the parts (*i. e.* common ideas or the many) and know from their experience of the relationship, can understand the new idea or one or meaning.

Faraday in a lecture on the "Conversion of Force" says:

"Doubtful as I ought to be of myself, I am certainly very glad to feel that my convictions are in accordance with Newton's conclusions. At the same time, those who occupy themselves with such matters ought not to

depend altogether upon authority, but should find reason within themselves after careful thought and consideration, to use and abide by their own judgment. Newton himself while referring to those who were judging his views, speaks of such as are competent to form an opinion on such matters and makes a strong distinction between them and those who were incompetent in the case."

The "Universe" has three prefaces by men of wide reputation.

Mr. John Dewey has written a preface to the "Universe" and states in part:

"Mr. Klyce has taken commonsense in its radical and simplest form, the form of stating or making anything known. He has himself pointed out the reason why his thought is not always easy to follow. The most difficult thing in the world to learn to see is the obvious, the familiar, the universally taken for granted. Taken as a sketch of a certain way of discovering the meaning of knowledge in general and in its typical branches, Mr. Klyce's book is remarkable, noteworthy. If experts in various lines shall find his special results as fruitful, as illuminating, as his general treatment of knowledge and technical philosophy has been to me, the remark just made will turn out to be altogether too moderate."

David Starr Jordan says in part:

"Mr. Klyce makes no attempt to solve any scientific problem by pure reason, but he would have us make rational use of the knowledge we possess. As to fundamental coordination of all which exists, known or unknown, any consistent use of the word Universe implicitly asserts it. Man himself is able with fair success to make his way in the cosmos; obviously then he is not utterly alien. Not only does his continued existence prove him not alien, but furthermore, by taking thought, he can make headway against the forces of nature and thus in some degree shape his own career. A similar line of argument is shown to apply to every concrete thing of which we are cognizant. The burden of disproof of Mr. Klyce's thesis lies on him who, within the confines of the Universe, can conceive anything—matter, spirit, life, space, or times, which lies outside it."

Mr. Morris Llewellyn Cooke comments in part as follows:

"Of course a great industry will only result from the activities of great men. Most industrial leaders impress us as being literally worn out fighting against a flood of isolated facts and ideas. We need the unifying thought of this book. To be effective we need above all to make our lives simple. Men vary in their mental capacity, but it is undoubtedly true that some men with great capacities are not the match for men of ordinary abilities who "see life steadily and see it whole." I will be much surprised if to most men a reading of "Universe" will not make the struggle a far simpler matter than it usually seems to be.

"But a science that is unrelated is even more fearsome than an industry that is detached from life. Hence our obligation to the author for a master generalization in which science is made to seem but another manifestation of that Ultimate Reality to which the human spirit itself is kinsman."

"The Universe" demonstrates that "There is no exact science." At first such a statement strikes the reader as questionable and not demonstrable. However, after due consideration of the illustrations which the "Universe" supplies copiously from the reader's experience, such an off-hand opinion can be revised. Any engineer or scientist who has been engaged in the practice of his profession very soon realizes that absolute exactness is unattainable. Experience is his great teacher. Approximations based on his experience give him a useable solution of his problems rather than a dependence upon theory which to the unexperienced, means absolute and exact science.

For instance, a diameter and a circumference of a circle are two factors (common ideas). The new idea is the measurement of their length. The relationship is their relative length.

If the diameter is taken as the unit (or any even number of units) of measurement it is apparent that the length of the circumference in terms of that unit cannot be exactly expressed numerically regardless of how many figures are added to our numerical relationship 3.1415+, and vice versa for the expression of the length of the diameter in terms of the length of the circumference.

Measurement of linear dimensions should certainly be an exact science if such is possible but it is not only practically impossible to obtain perfect accuracy but it is theoretically impossible. Although for all purposes approximations are used in valid science which are satisfactory. This is the distinction between an exact and valid science as I understand the author's idea that "there is no exact science."

The following quotation from the "Universe" expresses an idea which has been gradually dawning on the world since Bacon's time that:

"All real or absolute proof is actual observation or experience or experiment—seeing for ourselves. I cannot see for the reader; hence he has to get all the actual proof for himself, and make his own discoveries. If there is for him any discovery in this book, he makes it—not I. Hence, logic, which is the formal technique or trick of consistent expression cannot give any real proof. Logic gives expressional proof only and such proof is reduction of expression to truism."

Some of the particular things the book is advertised to do are the following:

"Establishes a sound logic. The logic used by the ordinary man is right; that used by Aristotle and nearly all books is wrong.

"Removes the fundamental error from mathematics, and makes mathematics simple; proves Euclid's 'axiom' about parallels, and intelligibly solves the various problems of non-Euclidian and n-dimension space.

"Revises and unifies the equations of physics. Completes conventional 'theories' of physics—about a dozen, and makes a somewhat new one that is easier:—vortex whirls.

"Shows how gravity works. Shows what is wrong with Newton's law of gravity and why. Makes Einstein's theory actually intelligible—showing that it is one sort of possible language out of an infinite number of possible

valid languages or logics. The book shows that every-day language (Euclid's and Newton's and Christ's) is valid, and the most economical and practical—and uses it.

“Shows intelligibly what electricity, light, matter, energy etc., are. Gives birth, life, death; of solar system.

“Shows how to get energy out of atoms, etc.

“That simple and easy physics is used in the last third of the book to solve qualitatively the more complicated human problems—those of age, growth, death, life, birth, sex, medicine, immortality, good and evil, freedom of will, religious experiences and ethics in general, money, taxes, business principles, value, etc.

“Proves that the Constitution is right, and shows what democracy is, and proves that it is right and that all other forms of government and ‘legal’ law are wrong.

“Proves (verifiably, of course) the doctrines of Christ; disproves the essential ones of Paul and theologians.”

Now at this stage the reader will probably ask himself the question, “Provided it does this, what is the immediate practical benefit to me or to the World?” The following anecdote is related of a visit by Gladstone when Prime Minister of England, to the laboratories of the Great Master of Physical Research, Michael Faraday. Faraday had been to some trouble in explaining or trying to explain to Gladstone one of his discoveries. Gladstone, as a practical man of affairs, immediately asked, “What is its use?” Faraday was apparently chagrined for a moment and then it is recorded that he stated, “Why Mr. Gladstone, what is the use of a new-born babe?” and after a slight pause he continued, “Maybe you can tax it in the future.”

The practical technical worth of the book is that it unifies the knowledge and experience of practical theorists and theoretical practitioners. The theorists who won't recognize the value of practical experience and the so-called practical man who condemns all theory, should read the book. Men who have profited by theory, without becoming worshippers of theory and exact science, and who have had experience in producing results, will appreciate the unification of theory and practice by the author.

Men who tell us what ought to be rather than what can be; and those who pride themselves on knowing the exact solution of any problem will not approve the book.

The book will not appeal to worshippers of words. But to those who use ideas, to those who think—*i. e.* observe the relationships existing between events in their experience,—and to those who believe that this world is interesting and worth while even though it has no *exact science*, a careful reading of the “Universe” will not be without compensation, with a word of warning that the “Universe” is hard reading.

J. O. F.

"The Next War." By Will Irwin. Price \$1.50. (E. P. Dutton & Co.)

This book is a brief but comprehensive review of the developments and after effects of the World's War, and prophesies what might happen in the next war should the nations of the world become involved in another great conflict.

In a general way, the author reviews the history of war from the earliest records to the present day, with its modern armaments and wholesale methods of slaughter. He explains that the use of poison gas by the Germans, in spite of international agreement, was a logical result of the developments of present day warfare, and predicts that in future wars, gas will be much more extensively employed.

New means of human destruction will make the horrors of the last war pale by comparison. Lewisite, a gas recently discovered in this country, has fifty-five times the "spread" of any other known gas, and is far more deadly. Tanks will be developed into great gas proof, land dreadnoughts. Air forces will be improved and enlarged, and the use of deadly germs seems probable.

These future weapons will not only be used against the actual fighting forces, but the civilian population will be fair game as well, for with "the nation in arms" and all of the resources of a country enlisted to carry on the war, no part of the population will be considered immune from attack.

The author discusses the economic aspects of the late war and the useless expenditures of money for destructive purposes. In 1920, it was estimated that 93 per cent of the national revenue was used in paying up obligations contracted during the last and previous wars, and it is pointed out how much better this money might be employed in the development of our national resources and in other constructive ways. The harmful effect upon human kind through the killing off of the youth of a nation is also touched upon, whereby the old and unfit are left behind to perpetuate the race.

In the concluding chapters, the commanding position of the United States amongst the world powers is pointed out and the opportunity presented this country to use its influence towards world peace. Limitation of armaments is believed to be one of the first steps to be followed by some sort of international agreement or association of nations whereby vexing questions might be settled without recourse to arms.

The author believes that peoples should be educated in the duties of nations to the world at large, and the submersion of selfish interests for the common weal. Some such action should be taken as soon as practicable or else the remembrances of the burdens and horrors of the past war will gradually fade, and the same old questions will arise again to endanger the peace of the world. The best safeguard against war, is a world wide realization that war does not pay.

The book is a small volume that can be read in an evening's sitting, the subject matter is presented in a clear and forceful manner, and its arguments are illuminating and conclusive. Dr. Frank Crane in commenting upon this book says "Unreservedly, I place it as the best book in the world right now for every man and woman in America to read, including the President and the Senate."

H. D. C.

## NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-ninth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

### ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election, and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

### ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, \$3.50; enlisted men, U. S. Navy, \$3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

## SPECIAL NOTICE

### NAVAL INSTITUTE PRIZE ARTICLE, 1923

A prize of two hundred dollars, with a gold medal and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the opposite page are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1922 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1922. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1922 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

- (a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and number of original lists on which each article appeared.

- (b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

- (c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

- (d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

F. M. ROBINSON,

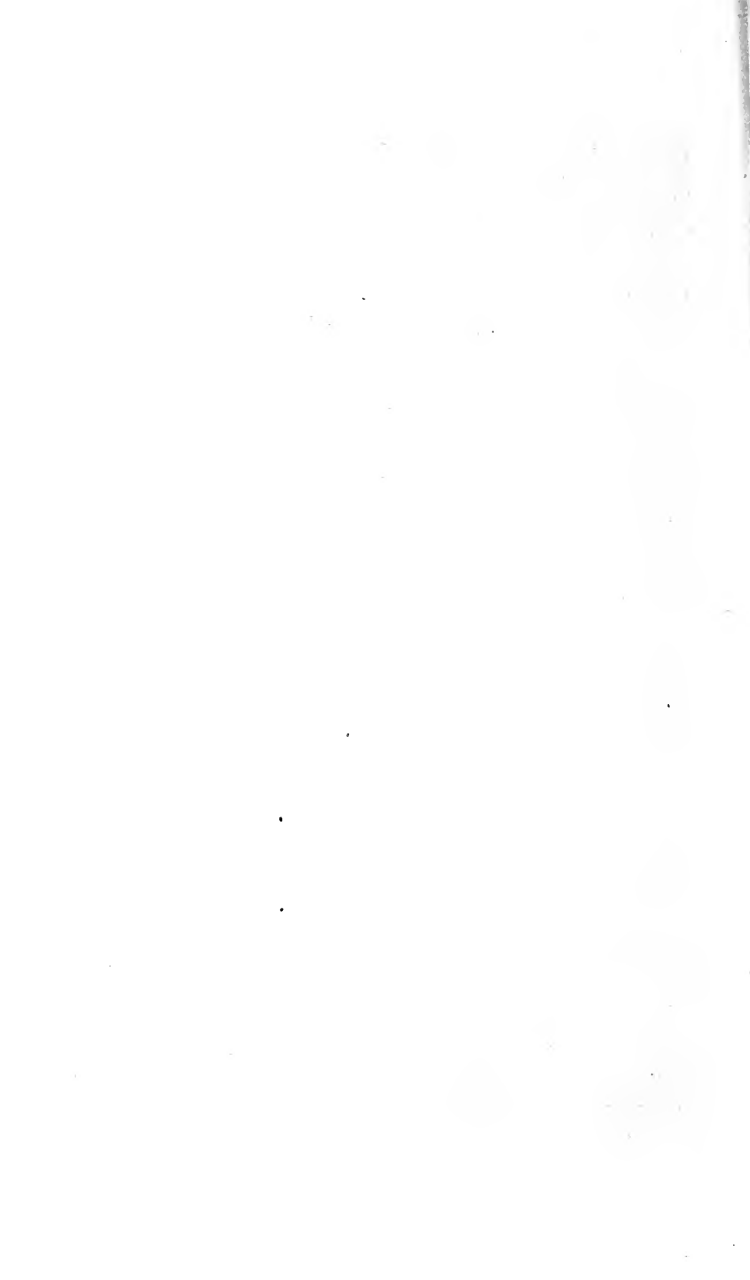
*Lieut. Commander, U. S. N., Secretary and Treasurer.*



## TOPICS FOR ARTICLES

### SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

The Naval Policy of the United States.  
The Navy: Its Past, Present and Future.  
The Fighting Fleet of the Future.  
Factors Governing American Naval Strength, Absolute and Relative.  
The Navy in Battle; Operations of Air, Surface and Underwater Craft.  
Escort and Defense of Oversea Military Expeditions.  
The Place of Mines in Future Naval Warfare and the Rules Which Should Govern Their Use.  
The Relation of Naval Communication to Naval Strategy.  
The Influence of Topography on Strategy.  
International Law.  
Principles on Which Should be Founded the Freedom of Neutral Shipping on the High Seas.  
The Present Rule of Neutrality Regarding Contraband and Blockade—  
Is it Justifiable in Ethics or in Expediency?  
What Will be the Status of the Submarine in International Law?  
Aircraft—Its Place in Naval Warfare.  
Aircraft, Practical Power of.  
Aircraft Warfare, Laws of.  
Aviation—Its Present Status and its Probable Influence on Strategy and Tactics.  
The Control of the Sea from Above.  
The Navy Air Service, Its Possibilities, Rôle and Future Development.  
The Anti-Aircraft Problem from the Navy's Viewpoint.  
Surface Craft, Future Rôle of.  
Armor or High Speed for Large Surface Vessels.  
Naval Gunnery of To-day, the Problems of Long Range and Indirect Fire.  
Mode of Design and Armament of Ships to Meet the New Conditions of Aerial and Sub-Surface Attack.  
Future Development of the Naval Shore Establishment.  
Naval Bases, Their Number, Location and Equipment.  
Strategic Requirements of the Pearl Harbor Naval Station.  
The Navy Yard as an Industrial Establishment.  
A Mobilization Program for the Future.  
Naval Organization from the Viewpoint of Liaison in Peace and War Between the Navy and the Nation.  
Organization of a Naval Communication Service.  
Scope of Naval Industrial Activity and the Navy's Relation of Naval Strength.  
Social and Industrial Conditions in Relation to the Development of Naval Strength.  
The Future of the Naval Officers' Profession.  
The Naval Officer and the Civilian.  
The Naval Officer as a Diplomat.  
The Mission of the Naval Academy in the Molding of Character.  
The Limits of Specialization in Naval Training.  
The Training of Communication Officers.  
Navy Spirit—Its Value to the Service and to the Country.  
Morale Building.  
Military Character.  
Amalgamation of the Supply Corps, Construction Corps and Civil Engineering Corps with the Line of the Navy.  
The Influence of the Term of Enlistment on the Efficiency of the Service.  
Shore Duty for Enlisted Men.  
Physical Factors in Efficiency.  
Health of Personnel in Relation to Morale.  
America as a Maritime Nation.  
Our New Merchant Marine.  
The Adaptability of Oil Engines to all Classes of War Vessels.



# United States Naval Institute

## Proceedings

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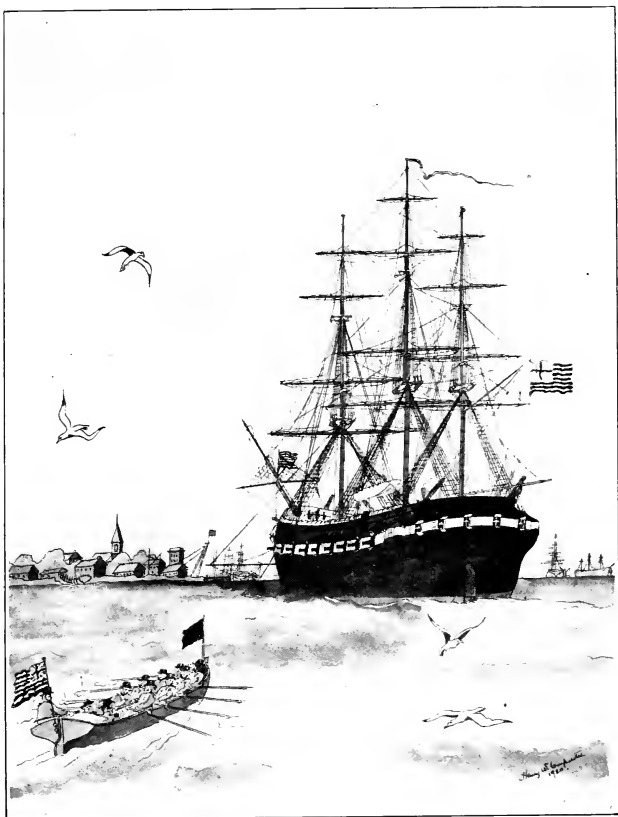
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1911





### U. S. S. ALFRED

The first battleship ever owned by the United States of America, commissioned at Philadelphia, Pennsylvania, December 23, 1775, Lieutenant John Paul Jones commanding. He received her into the Navy on December 3, by hoisting the "Grand Union Flag," the first "Flag of America," as Jones called it, at her mast-head. Taken at the time Admiral Essex Hopkins, the first and only Commander-in-Chief the Navy ever had, took command of the fleet of six war vessels.



# UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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## THE AMERICAN COLORS

By REAR ADMIRAL COLBY M. CHESTER, U. S. Navy

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The first step undertaken by the American people towards nationalism was the passing of a resolution by the Continental Congress, assembled at Philadelphia, on June 14, 1775, appointing a committee "to consider, inquire, and report with respect to the organization of a naval force" for the protection of the United Colonies. The appointment of George Washington "to be General and Commander-in-Chief of all the forces now raised or to be raised by the United Colonies" did not become law until some ten days later, viz.: June 23, 1775. One would not pretend to imply that this initial movement on the part of the Colonists for offensive defense against the unjust acts committed by Great Britain towards our forefathers, was taken with a view to organizing a national government in this country. At this early stage of revolution, nearly all of the twelve different colonies in America, Georgia not yet being represented in the convention, had absolutely prohibited their delegates to the Continental Congress even to discuss the question of separation from the mother country. The leaders of the great revolution, however, such as Franklin, the Adamses, Patrick Henry and Jefferson, then clearly saw the handwriting on the wall and were first, last and all the time in favor of establish-

ing a new government "of the people, for the people, and by the people." John Adams, who did more towards the establishment of the Navy, and, indeed towards the inauguration of the American flag than any other one man in the country, outside of the Navy itself, clearly had this new government in mind when he voted for the resolution to establish a belligerent force entirely under the control of the United Colonies. Later, despairing of getting the delegates in Congress to favor separation from the Kingdom of Great Britain, he wrote his wife, "As to declarations of independence, be patient. Read our privateering laws and our commercial laws. What signifies a word?" Also Franklin, when the motion was before the Congress to establish a volunteer navy, as the privateers rightfully should be called, moved that it be preceded by a declaration of independence, as the act in itself, said he, was but a declaration of war and war meant independence.

The Marine Committee, appointed by Congress, to inaugurate the first offensive movement against the common enemy, naturally knew but little of such matters as they were called upon to consider, except Robert Morris, the distinguished financier and shipping merchant of Philadelphia, but he was so busily engaged on many matters presented for his consideration as not to be able to give much time to purely naval subjects. Therefore a Board of Experts composed of four Master Mariners was called upon to assist the Committee, and the first sailor man commandeered for the purpose was Captain John Paul Jones, "a distinguished citizen from Virginia," who early in the conflict had offered his services to his adopted country in case of war. The cornerstone of naval structure, later to become the greatest Navy in the world, may now be found in concrete form on the monument of "The Founder of the American Navy," in Potomac Park at the foot of the Capitol of the Nation. It is composed of the memorable words of Captain John Paul Jones to the Continental Congress on September 25, 1775, regarding the personnel of the Navy.

Now the very first step undertaken after the formation of a civic society is the establishment of a banner of some kind to represent what the organization stands for and to rally its members. Particularly in the case of a navy intended to act upon the seven seas of the world a flag is an essential part of the organization. International law requires that all ships afloat in neutral

waters should carry the flag of some recognized nation, otherwise they may be charged with piracy and sent into port for trial by Admiralty Courts. Land forces, on the other hand, come under the jurisdiction only of the governments controlling the territory and it is a matter of no importance to aliens what colors they carry. In the case of the American Colonies colors were a matter of indifference to the enemy, for to him all the rebels appeared "to be tarred with the same brush" and a shot fired in the direction of any old flag was sure to hit a culprit, if it hit at all. As far as state troops were concerned, they did not and would not wear a banner representing a union of rebellious forces until after the promulgation of independence on July 4, 1776, and even then the flag of the colony to which they belonged meant more to them than any union symbol could do. States' rights sentiment in the north in revolutionary days was stronger, even, than it was in the south in the rebellion period.

On the other hand the Navy was a truly federal force from the time of its inception. Its members were all enlisted, commissioned and directed in the name of the United Colonies, and the states from which they came had nothing to do with them. The first measure to be taken up by the Board of Master Mariners, of which Paul Jones was the working head, was, therefore, the question of establishing a flag for the force. Ships were necessary to form the fleet, but a ship without a flag was as defective as one with no rudder. A rudder was required to steer the vessel through the shoals and dangers of the sea, while the flag was to guide her through the equally troublesome waters of international comity.

What then should the colors be?

It must be remembered that in the year 1775 there was no concerted thought in the minds of the members of Congress looking towards separation, and the British King was still the head of the existing government, therefore the Union Jack of Great Britain was selected for the union, or canton, of the flag. The crosses of St. George and St. Andrews, representing the union of England and Scotland, formed the basis of the flag and to the red field of the then British standard six white stripes were superimposed, forming thirteen alternate red and white stripes. These same thirteen stripes in association with the cross of St. George only had been worn as the standard of British

Admirals, on board their flag ships, for nearly a hundred years before adoption as a part of the "Flag of America," as John Paul Jones called it. They offered an appropriate symbol, therefore, to represent the new "fleet in being" the Americans were about to establish.

The Grand Union Flag, thus designed, and so officially styled in the first Signal Code issued by authority of Congress to American men-of-war, stood for the Mother Country to which the Colonies still belonged and the "sea power" of the budding republic. This emblem of sovereignty was authorized some time during the summer of 1775. This statement is supported by the fact that when Congress, on the thirteenth of October of that year ordered the fitting out of two vessels to proceed to the eastward and try to capture two British transports known to be coming from Scotland to Nova Scotia (loaded with supplies for the enemy), the sloop *Hornet* lying in Baltimore harbor, was one of the vessels selected for the purpose, and a Grand Union Flag was sent from Philadelphia to be hoisted on board that vessel when commissioned for service. *The Biographical Dictionary*, compiled by Thomas J. Rogers, in 1824, in referring to Commodore Joshua Barney, U. S. N., mentions the incidents connected with the commissioning of the *Hornet* as follows:

Returning to Baltimore early in October, 1775, Barney obtained the situation of Master's Mate in the sloop *Hornet*, commanded by Captain Stone, and on receiving a flag from Commodore Hopkins he placed it upon a staff and with drums and fife beat up for volunteers, and in one day engaged a crew for the vessel. This was the first flag of the United States seen in the State of Maryland and Barney claimed some credit for carrying it.

The story is also related with rather more detail in the private journal of Barney himself.

On the thirtieth day of October, 1775, Congress having received the report of the Naval Committee drawn up by Captain Jones, passed an act appropriating money for the purchase of a number of vessels to form the navy. This date may be called the "Birthday of the American Navy." The vessels selected by the Jones Board were soon refitted as men-of-war and, on December 3, 1775, at Philadelphia he placed in commission the first battleship the country ever owned, by hoisting the Grand Union Flag

at the peak, while at the same time as temporary commanding officer he had hoisted at the mainmast head of the *Alfred*, his own narrow, or "commission pennant" as it is called in the service. On the twenty-third of December following Congress commissioned General Essex Hopkins of Rhode Island, a sailor of distinguished record, as Commander-in-Chief of the Fleet, the *Alfred* becoming Flag Ship of the force and the vessels were practically all in service before the end of the year.

So much confusion has arisen over the question of the title for the Colonial flag, which is frequently called the "Cambridge flag," that it seems important to explain away such contentions. The State troops of which General Washington assumed command on the third of July, 1775, were not organized as a Continental Army until January 1, 1776, as will be shown by the following copy of an order issued by Washington himself. On that date the "Grand Union Flag" which had been worn by naval vessels for some months, was hoisted for the first time by the Army and by irresponsible authorities it was called the "Cambridge flag" because it was noted in the British newspapers as having been seen at Cambridge on January 2.

General Washington's order reads :

Headquarters, January 1, 1776.

*Parole*:—The Congress—COUNTERSIGN: America.

This day gave commencement to the New Army, which in every point of view is entirely Continental, the General flatters himself that a laudable spirit of emulation will now take place and pervade the whole of it. . . . This being the day of the new establishment.

On January 4, following, Washington wrote his Secretary, Colonel Joseph Reed :

On that day, the day that gave being to our new Army, but before the proclamation came to hand, we hoisted the Union flag as a *compliment* to the United Colonies.

Later, on the twentieth of February, 1776, Washington himself prescribed the colors to be worn by the Army specifically, as will appear from the following copy of a General Order publishing Acts of Congress and regulations concerning flags :

As it is necessary that every regiment should be furnished with colors, and that the colors should, if it can be done, bear some kind of similitude to the uniform of the regiment to which they belong, the Colonels with

respective Brigadiers and the Q. M. General may fix upon such as are proper and may be procured.

Now let us see what was being done by the Navy regarding the flag. According to the news press of Philadelphia the substance of which was duplicated in Newburn, N. C., repeated by a correspondent in Nassau, on the Island of New Providence, and published in London, the first American Fleet ever organized in the last of December, 1775, sailed "from Philadelphia midst the acclamation of many thousands assembled on the joyful occasion, under the display of a Union flag, with thirteen stripes in the field, emblematical of the thirteen United Colonies." After some delay, the six vessels under the command of Admiral Essex Hopkins took their departure from the Delaware Capes on February 17 with the same flags that had been displayed at Philadelphia snapping before a strong breeze freshening for a northeast gale of wind.

On the third of March, 1776, Admiral Hopkins, carrying the war directly into the enemy's territory, captured the port of Nassau, in the British West Indies, over which for a time was hoisted the American Flag. He also captured the Governor of the Province, whom he brought home to keep as a hostage to prevent the enemy from treating their prisoners as rebels. But a more beneficial result of the engagement arose from Hopkins' bringing away as spoils of war nearly a hundred heavy guns and tons of munitions, which fell into our hands "to hearten our troops on shore," as Washington said, "and bring about a new issue to the campaign." Some of the guns figured on nearly every battlefield of the war. This first victorious conflict of the war with the enemy was followed by victory after victory on the sea by the little regular navy of the Colonies, later supported by the volunteer navy authorized by Congress on March 23, 1776, making a total force of some 1,400 combatant ships, manned by over 70,000 seamen and marines, engaged during the war. These were equal in power to as many regiments of infantry of the average strength of that early period of the country's history, or to a land force of 350,000 infantry.

On the fourth of July, 1776, America declared her independence from the mother country and a new nation was born. Up to this

time the country possessed no official flag to represent it. A flag had been established for the Navy by authority of Congress but it now became essential to own a real national flag. This matter was especially important to the sea forces and naval officers did their part towards bringing about the establishment of the flag. As early as December, 1776, Commodore John Barry commanding the Delaware fleet with headquarters at Philadelphia, argued with the Board of Admiralty that it was essential that his vessels be provided with suitable flags to go into battle, and begged that a design for a flag be approved that he might have some made for the fleet. Still Congress delayed action. Everyone recognized that it was a naval question, as it has been from its inception up to the present time, but landsmen in Congress knowing nothing of maritime matters would not, and did not, for a long time after independence, concern themselves with the subject. Pages of the *Congressional Record* of the war period are given over to acts relating to the Army, but rarely can you find the Navy mentioned in its files.

The naval service was naturally satisfied with the red and white stripes, floating under which it had already won glory (and they represented "a fleet in being"). It is a notable fact that Commodore John Paul Jones, who received the first salute to the American Flag, which gave recognition abroad to the country as a nation, selected for his own personal Commodore's broad pennant, a flag made of red, white and blue stripes with the American Jack in the corner, thus showing the disposition of the Navy regarding the stripes. The stripes were therefore fixed as far as the Navy was concerned, but what should be substituted for the Union Jack of Great Britain in the Grand Union Flag? The New England States had already used the star in some of their ships' flags and it was natural in those stirring times to look towards the heavens for a selection of objects for the field of the flag. There still exists in Boston an original copy of the *Massachusetts Spy*, dated March 19, 1774, containing a song on the anniversary of the Boston Massacre:

A ray of bright glory now gleams from afar,  
The American Ensign now sparkles a star,  
Which shall flame wide through the skies.

Naval officers had drawn up the design for the flag and urged its adoption. Robert Morris, now the efficient Secretary of the War Board, lent his aid to secure action by Congress. As early as February, 1777, in dispatching the first of the new American frigates to sea, he wrote the Captain, "Your prime duty will be to uphold the honor of the Flag." Is it conceivable that he and Captain Chew, commander of the vessel, knew not the character of the flag that was to be? The men of the navy made all its flags in those days on board ship and it is more than probable that a ready-made flag was in the locker of the frigate at the time, ready to fly the moment Congress could be induced to confirm the design. But what was especially needed was a leader, who could impress upon Congress the importance of the subject; and one was found. In December, 1776, Captain John Paul Jones had returned to Boston from a brilliant cruise in command of a squadron of vessels, during which he had captured nearly a score of the enemy's supply and merchant vessels, and as the credit, morale, and hopes of success of the Americans were then at their lowest ebb, Jones became the hero of the hour. He at once began to weight the mail pouches for the Capitol with urgent pleas that he might come there and lay his schemes for aggressive action against the enemy before the War Board. He laid particular stress upon the necessity of sending a naval force abroad, not only to carry on raids upon British commerce, but to influence foreign nations to support our holy cause.

At last the Board of Admiralty directed Jones to come to Philadelphia with the principal object of placing his plans before Congress. Upon reaching the "Quaker City" early in April, he soon had members of the national legislature calling upon him for advice concerning the activities they had in mind and eager to hear of the schemes he proposed. Possessing a most fascinating personality, which, as Lafayette wrote later, gained him the entrée to royal palaces in France, the gallant young naval officer drew about him a bevy of the pretty girls for which the capital was noted, and won his way into the hearts of the legislators through the smiles of their daughters. Jones soon secured what he wanted, the promise of an independent command abroad, but he could not appear off the coast of England with a ship flying the Union Jack



of Great Britain, such as existed at the time, and Congress must give him a suitable flag for the occasion, representing the "new constellation" that was born nearly a year before.

As Webster once said of the Washington Monument, "When the ladies took hold of the stones the monument began to rise," so it may be said of the fair sex of Philadelphia, when the ladies took hold of the stripes, the stars began to rise, and largely through their exertions, Congress took action, on June 14, 1777, and:

*Resolved:* That the flag of the thirteen United States be thirteen stripes, alternate red and white; that the union be thirteen stars, white in a blue field, representing a new constellation.

*Resolved:* That Captain John Paul Jones be appointed to command the said ship *Ranger*.

There were other resolutions included in this law of Congress, one of them stating why Paul Jones was appointed to command the *Ranger*, but as every clause in the bill related to naval affairs, it would seem, to use a paraphrase of the day, that "Congress was in session as a committee of the whole on the state of the Union," with a naval bill before it for consideration.

In the meantime some of the belles of the city formed a sewing bee and when Jones was about to take leave of the numerous friends he had made there, he was presented with the first Star-Spangled Banner ever made in the country, manufactured by the delicate hands of "the girls he left behind him." The history of this flag would fill a volume and is not to be undertaken here. Suffice it to say that this identical flag is believed to grace the National Museum at Washington today. It shows the horizontal alignment of the stars, *twelve* in number, representing a "new constellation" which by its sponsor, the Navy, has never been changed.

No other flag of national design formed in revolutionary times now exists, to my knowledge, in the country, except perhaps it be the . . . flag hung in the State House at Boston, but this, too, shows the standard alignment of the stars as established by the Navy, refuting all claims as to the validity of painted flags with stars arranged in a circle.

The flag made by the fair sex of Philadelphia, known as the "Stafford flag," was taken by Jones to Portsmouth, New Hamp-

shire, where his new command, the *Ranger*, was fitting for sea, and, later, it floated over the *Bon Homme Richard* in the battle with the *Seraphis*. Arriving at Portsmouth on the third of July, 1777, Jones, according to what has now become a pretty well established fact, loaned his pet flag to his friend, Captain Thomas Thompson, of the U. S. S. *Raleigh*, sister ship to the *Ranger*, of which vessel, owing to the fact that she was practically ready for sea, he hoped to secure command in lieu of the *Ranger*, in case Thompson should be promoted to a shore station according to Jones' recommendation to the Board of Admiralty. The next day, being the first anniversary of the birth of the nation, great preparations were made on board the *Raleigh* to celebrate it with appropriate ceremonies, as noted in still existing newspapers of the town, the principal part of the ceremonies, in accordance with naval custom, being "honors to the flag."\* The law of Congress now provides that new stars, to represent states coming into the union during the fiscal year, shall begin their existence on the Fourth of July. Consequently this date is the real Flag Day of the Navy. The number of stars still showing in the Philadelphia flag may be accounted for by the uncertainty regarding the status of South Carolina as a state in the union, at the time the ladies of Philadelphia made the flag.

Captain Thompson's commission as a Captain in the Navy, bearing the date of October 10, 1776, is made in the name of twelve states, ending with "North Carolina and Georgia," but no South Carolina is mentioned, which shows the Stafford flag was made before the Act of Congress of June 14, 1777, when thirteen stars were officially recognized. That the American National Flag was devised for the Navy, as this article implies, is supported by the correspondence of Washington, copies of which follow :

War Office, May 10, 1779.

Sir:

The Board have been frequently applied to on the subject of Drums & Colors for the several Regiments. It is impossible to comply with all the Requisitions for these Articles, as we have not material to make either

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\*On the same Fourth of July, 1777, but some sixty minutes later owing to difference of time, as stated by the press, a number of ships-of-war stationed in the Delaware River, off Philadelphia, were bedecked with the Star-Spangled Banner in honor of the occasion.

in sufficient numbers. We hope, however, to have in a short Time a competent Number of Drums. So soon as they are made we send them to Camp as we find many Irregularities and Inconveniences arising from delivering them or any other Articles here.

As to Colors we have refused for another Reason. The Baron Steuben mentioned when he was here that he would settle with your Excellency some Plan as to the Colors. It was intended that every Regiment should have two Colors, one the Standard of the United States which should be the same throughout the Army and the other, a Regimental Color which should vary according to the facings of the Regiments.

But it is not yet settled what is the Standard of the United States. If your Excellency will therefore favor us with your opinion on the subject we will report to Congress and request them to establish a Standard and as soon as this is done we will endeavor to get Materials and order a Number made sufficient for the Army. . . .

RICHARD PETERS.

By order.

*His Excellency the Commander-in-Chief,*  
(GEORGE WASHINGTON.)

In a letter from the War Office, dated Sept. 3, 1779, signed Richard Peters, by order, to General Washington this appears:

The enclosed Drafts of a Standard for the Army are sent for your Approbation. The Officers will be by & by pressing for Colors & if materials can be found they shall be made when you send us your Ideas of the Plan of the Standard. The one with the Union & Emblems in the Middle is preferred by us in being VARIENT\* from the Marine Flag.

In the reply from General Washington, dated Head Quarters, West Point, 14th of Sept. 1779, is the following:

I agree with your opinion, that the Standard, with the Union and Emblem in the Centre, is to be preferred with this addition, the number of the Regiment and the State to which it belongs inserted within the curve of the serpent, in such place as the printer or designer shall judge most proper.

On August 8, 1782, the War Office writes:

The Colors are ready and will be immediately sent as also the Drums and fifes as fast as they can be obtained.

The last letter in this correspondence is a letter from Gen. Washington to the War Office dated Headquarters, 11th March, 1783, reading:

The Standards I have found, examining, to be in the Care of Mr. Frothingham, Field Commissary of Military Stores. Your intimation in your last, is the first Notice, I had, of their being near me.

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\*Author's capitalization.

It appears from this correspondence that at some time after Sept. 14, 1779, a Standard for the United States was adopted for the use of the land forces by the War Board, but not by Act of Congress; otherwise it would have been noted in the *Congressional Record*, as all Acts relating to the Stars and Stripes were. But even this "varient" flag to the National Banner did not come into general usage during the War.

Following the custom established by the War Board, in the Revolutionary War, the Army carried a Flag "VARIANT to the Marine Flag" until 1834, when, as clearly shown by Army Regulations, the Garrison flag became the National Flag. This was followed by another change in 1841, when the Regulations of the Army required the Infantry also to carry the National Flag; but not until the year 1878 was the Cavalry called upon to do so. The change of 1834 was brought about by the fact that Dutch men-of-war entering a harbor of the United States—probably Hampton Roads—finding the Artillery flag floating over the fortifications and the Star-Spangled Banner flying from ships of war in the harbor, were at a loss to know which flag to hoist and salute. Inquiry was made as to which of the two was the National flag, and our government designated that prescribed by law on April 4, 1818. The President then gave orders that all Army Garrisons, all of which were practically under the control of the Artillery, should fly the National Banner.

This issue of the Army Regulation leads up to a very interesting question as to how the Star-Spangled Banner, which flew over Fort McHenry and inspired Francis Scott Key to write the immortal song now generally recognized as our National Hymn, should happen to be the Red, White and Blue when, at that time, fortifications were not permitted to wear the National Flag. The answer is as follows:

Fort McHenry was not a federal work, but was owned by the city of Baltimore. When the British Fleet entered Chesapeake Bay, in the War of 1812, and was engaged in harassing the territory to the south, Baltimore citizens clamored for a naval force to come and protect their city from invasion. A naval force under Commodore David Porter was doing this duty at New York and another under Commodore John Rodgers was engaged in the

defense of Delaware Bay. A Flotilla commanded by Commodore Joshua Barney, a native of Maryland, was then established by the Navy Department to protect Baltimore, and the Chesapeake shores from raiding parties from the British fleet. At the time Washington became threatened from the sea Barney's Flotilla men were called into land service and they put up at Bladensburg the only fight for the protection of the capital that took place, the land forces all running helter-skelter for Baltimore. Rodgers' and Porter's sailor brigades were hurried to the Capital as soon as possible, but only reached the city in time to drive the British ships out of the Potomac River "in great distress." Then under the clamor of the Baltimoreans for sailors to come to their relief, the seamen that had acted so gallantly at Washington were hurried to Baltimore and Rodgers was placed in command of all the sea defences of the port, including six batteries and a portion of Barney's Flotilla.

In the meantime a small garrison composed of a company of regular Artillery was detailed for duty at Fort McHenry, but during the Battle of Baltimore the fort was mostly manned by a larger force of bluejackets and several companies of "seafencibles" belonging to the State, all the fortifications being under the command of Rodgers. Upon the invaliding of Major Armstead the immediate commanding officer of McHenry, owing to the hardships of the bombardment, Rodgers, anticipating the enemy's return to the fray, took personal command of the fort and made it the headquarters of the seaman division defending the city. He was thus employed until the people of New York and Philadelphia, fearing their cities were next to be attacked by the enemy, demanded the return of the seamen to protect them.

Thus Fort McHenry was at the time a purely naval battery, as were the five other fortifications forming the sea defenses of the port, and by right hoisted an especially large naval flag, made by the ladies of Baltimore for the Navy. It was the work of the Navy that saved Baltimore from the same fate that had befallen Washington, and in commending Rodgers for his gallant defense of the latter place, Secretary of the Navy Jones writes: "If your gallant sailors could have reached here in time, you would have had the honor of saving the Capitol from destruction." "That's the way we have in the Navy."

In the year 1795, in order to keep up with the march of events, the Naval Flag was changed from thirteen to fifteen stars and fifteen stripes, to represent Vermont and Kentucky, which states had recently joined the Union, and clamored for recognition among the stars. By 1816 five more stripes were called for under the law, to recognize the advent of five additional states which had come into the Confederacy since Independence. In the meantime it was seen that with the natural augmentation of states to the federation, the stripes must soon become only a thread-like marking hardly discernible at a distance or the size of the flag would become unmanageable. Naval officers saw the difficulties of the situation and Captain Samuel Chester Read, U. S. N., a hero of the War of 1812, proposed a scheme whereby thirteen stripes should represent the original thirteen colonies that formed the Union, while the number of stars should stand for all the States that should have entered the federation by the Fourth of July of each year.

Again it was difficult to get Congress to take action, but after two years of painstaking education a law was passed on April 4, 1818, establishing a new National Flag.

A standard flag made from the Read pattern was sewed together by the delicate hands of the Captain's beautiful wife, accepted by Congress, and immediately hoisted over the Nation's Capitol at Washington. Is such a model of our National Banner not good enough to be followed in these stirring times, when the American flag means so much to the world?

The legal claim for the immunity of the Country's flag from desecration may be summed up in the following:

#### BRIEF

On April 4, 1818, the Representatives of the people of the United States of America, in Congress assembled, passed a law reading as follows:

#### AN ACT TO ESTABLISH THE FLAG OF THE UNITED STATES

SECTION 1, that from and after the fourth day of July next, the flag of the United States be thirteen horizontal stripes, alternate red and white; the union be twenty stars, white in a blue field.

SECTION 2, That, on the admission of every new State into the Union, one star shall be added to the union of the flag; and that such addition

shall take effect on the fourth day of July then next succeeding such admission.

A proposed amendment to the flag bill establishing another type of flag for use in the Army and the Merchant Marine in accordance with British custom, was at once voted down as it was the wish of the majority that all American interests should be represented by one flag and only one. By a principle of law this negative postulate following from the resolution, prohibits any alternate to the standard flag established by Congress ever being adopted, except by the same authority that originated the design. In other words, it is the law of the land today that no other flag than the one thus legalized shall represent the American people.

As confirming this view of the case, it may be added, that by an Act of Congress adopted in 1797 the United States Coast Guard, then the Revenue Marine, holding power to act belligerently in certain matters, was provided by Congress with a flag "varient to the Marine flag"; but since the passage of the law of 1818, the Coast Guard Service is required to fly the standard flag of the United States, though permitted to use the old flag with perpendicular stripes as a "burgee" to indicate the duty on which its vessels are engaged. This shows the intent of Congress to restrict the use of any other flag than the Star-Spangled Banner to represent the country by any force whatever, even if the law itself does not prohibit such usage specifically.

Still another case may be mentioned showing the application of the law, if its context be taken in connection with the discussion which took place on the introduction of the bill.

In the Appropriation Bill, approved March 3, 1865, a section was introduced, reading as follows:

It shall be lawful for the Secretary of War and the Secretary of the Navy and the Secretary of the Treasury to enter into contract for bunting of American manufacture as their respective services require for a period not exceeding one year and at a price not exceeding that at which an article of equal quality can be imported.

It is found in the Revised Statutes of 1878 and may be presumed to be in force today, affecting alike the three departments of the government.

The author of the bill, General B. F. Butler, M.C., from Massachusetts, full of patriotic zeal (though covertly inclined to "cheer

for the old flag and an appropriation") claimed that the colors of the bunting manufactured abroad, when exposed to the weather would run, which was not a characteristic of the American people. He therefore induced Congress to limit the use of material required in making the Star-Spangled Banner to American bunting. After this law had been enacted by Congress there was brought into the U. S. Senate Chamber a beautiful American flag made up of Red, White and Blue bunting of American manufacture, which was presented to Congress with suitable ceremonies and immediately hoisted over the National Capitol that all the world might see a real Star-Spangled Banner of Freedom.

Shall we now "play a yellow trick" on future generations and show by our actions that the flag represents a yellow-streaked race?

Speed in belligerent action at this time is more essential than ever before. No better maxim for grand strategy is available than that propounded by David Harum: "Do unto others as they would do unto you but do it first." One thing is certain that the majority of flags made of Japanese silk, or other such material, combined with an excrescent fringe of yellow wool, similar to that in common use today in the manufacture of what is called the American Flag, are not *fast* colors by any means, either as to feature of material or range of movement, and so may be objected to on that account. But witness a parade of American troops on any windy day. The color-bearers will be seen struggling to drag their silk, yellow-fringed banners against the friction of the air with a power nearly equal to that required for the advance. The flag should be carried at the head of the column, the speed of which is always regulated by that of its slowest unit. School children and sometime horny-handed soldiers even in such emergencies resort to "housing the flag" and thus belie the very root of patriotic sentiment regarding it. Oliver Wendell Holmes wrote:

Nail to the mast that holy flag,  
Set every threadbare sail;  
And give it to the God of storms,  
The lightning and the gale.

You cannot do that with a flag handicapped in its movements by having attached to it a yellow fringe; and such a drag will delay the columns reaching the enemy.



An example of the fallacy of the present usage of the American flag is pertinent. During the occupation of Northern Mexico, by the United States Army, in 1913, it became necessary for the colors to be kept planted, at the head of the column, continuously. The strong prairie wind that prevailed in that high altitude, acting against the yellow fringe girdling the flags, soon wracked them to pieces and the fringe had to be removed or the colors housed altogether. Do you wish to strike your colors because it rains?

There is another phase of this important legal matter that should be considered before we crystallize a policy, corollaries from which may possibly produce no end of trouble in the body politic; even now it is not by any means a dead issue. It has been argued that a red, white, blue and yellow flag has been adopted by the Army and recorded in the U. S. Army Regulations, which have the validity of law. But this is a fallacy. To be sure Congress has given the Executive Branch of the government under its Constitutional right to provide and maintain an Army, the power to regulate that service and its regulations are binding *with the force of law* for that particular department. But it might as well be said that the flag adopted by John Paul Jones, with the approval of the Navy Department, in 1778, to represent the U. S. European Naval Squadron, under his command, a flag composed of the same stars but with stripes of three colors—red, white and blue—also represented the Nation. Nobody outside of the Army, unless specifically designated by Congress, to be under the orders of the Secretary of War, is bound to comply with Army Regulations; which, unless impeached, stand for the land force only. General Grant himself, as Commander of the Army, refused to obey an executive order, issued by the President, because it was, palpably, opposed to the will of the people, thus setting an example that has been followed more than once.

NOTE—On November 23, 1921, Senator Walsh, of Montana, offered a resolution, in the U. S. Senate, requesting the President to authorize the delegates to the Conference on Limitation of Armaments to display a flag made by adding a white border to the national standard, "thus bordered as a peace flag." The resolution was promptly, and properly, laid on the table under the axiom that the Star-Spangled Banner, "unadorned," was always a symbol of peace.

This shows that even the President has no authority to add to the colors of the American Flag without the authority of Congress.

If it be a rule of action that the Secretary of War may add another stripe to the flag that Congress has declared shall represent the people of the United States, and may demand for them a national salute, why should not any civic society order a green fringe to be placed on the Star-Spangled Banner, to represent their special interests, or the I. W. W. give it a fiery red color, or the pacifists bind it around with a boa of white feathers? Consistency, thou art a jewel. Inconsistency, in this case, may mean death.

#### THE SANCTITY OF THE FLAG

The American Flag is composed of three colors and three only. The RED stands for the blood of our forefathers who formed the Nation as well as for the red corpuscles which shall fill the veins of all future generations living in this country. In other words, for Roosevelt's "red blood of Americanism." The WHITE, as stated by Washington, "will go down to posterity representing liberty." The BLUE typifies the Heavens from which we borrow the stars to represent "a new constellation," the home of the God in whom we trust as well as the deep blue sea that covers three-quarters of the terrestrial globe and in war, controls its little brother the land on which we live.

"The Sea is the Lord's and He made it" and

Perhaps the Master walks the sea  
As once he did of yore.  
And that is why it seems to be  
A part of Heaven's floor.

That flag is peculiarly a naval institution for it was made by and for the Navy, to be carried on the Country's First Line of Defense warning all aliens that "thus far shalt thou come and no further" with malicious designs on a free people.

The Navy has carried that flag to victory in wars with Great Britain, France, Spain and Germany; with Morocco, Algiers, Tunis and Tripoli, once powerful nations before which all the civilized world bent the knee; in Mexico, Paraguay and Colombia; in conflicts in China, Japan and Korea and in many other minor wars of which your histories make no mention.

The Navy has made that flag honored in every part of the world from the very tip of the ice-bound pole in the waters of

the northern aurora-borealis, where Peary planted it, to the Continent of Antartica, discovered by Admiral Wilkes of the Navy, under the Southern Cross; from the "Cradle of Liberty," at Philadelphia, "where it was born, to and through Hermit Asia, carried hence on the white wings of American battleships commanded by Perry, Shufelt and Dewey; into the pall of 'Darkest Africa' and so on, still westward ho! back to 'the land of the brave and the home of the free.'"

The Navy, under Paul Jones, was the first and only force ever to hoist that or any alien flag over the soil of Great Britain, the strongest peace ambassador ever sent to Europe. The Navy flung that starry banner to the breeze over the captured port of Derne, in Tripoli, to teach Africa and all the world the American doctrine of "millions for defense but not one penny for tribute." The Navy, in 1847 as well as in 1913, hoisted that flag over the City of Vera Cruz and would have forced it to be saluted at Tampico, as was done a short while before, at Laguayra, but for the wireless that took the matter out of its hands. The Navy was the first branch of the National Defense to display the Banner of Freedom over the new-found colonial possessions in the Philippines, fixing solid the John Hay policy of the "open-door" in Asia. That same thirteen-starred boat flag of the Navy that was planted by Dewey in the Far East now graces the Hall of Fame in Washington, where all who run may read the purpose of the Flag. With such a record as this would you teach your children who sing the National Anthem that there is a yellow strain in "Columbia, the Gem of the Ocean" it represents? And has the Navy that has born, bred, and mothered that glorious banner for a century and a half, double the time of any other fostering care—no call to bespeak for the tri-color the reverence due its birth?

And now let the author ask with all the patriotism and love of the flag born of more than half a century of service under the Star-Spangled Banner, if it is the intention of the American people to add another color to the red, white and blue, under whose folds millions have fought, bled and died to raise the country to the rank of the First World Power, inspired to valiant deeds by the oldest, most battle-scarred LOYAL Standard in existence? And, if so, is that color to be a "yellow streak," which, by common consent, has come to stand for the lowest and meanest stratum in the human race? Even a yellow dog made so by nature, is a

target for tin pans and the abuse of children and you resent a charge of playing a "yellow trick." But leaving aside all sentiment regarding the color, do you want to superimpose another tint than the red and blue on the basic white set as a standard for liberty by Washington?

Colonel Henry Watterson, the Poetic Songster of the Bluegrass Region, in a stirring tribute to the Flag delivered at the bier of Francis Scott Key, the author of our National Anthem, said:

The Star-Spangled Banner! Was ever Flag so beautiful, did ever Flag so fill the souls of men? The love of women; the sense of duty; the thirst for glory; the heart throbbing that impels the humblest American to stand to his colors fearless in the defense of his native soil, and holding it sweet to die for it—the yearning that draws him to it when exiled from it—its free institutions and its blessed memories, all are embodied and symbolized by the broad stripes and bright stars of the nation's anthem.

This is not done by the appended yellow fringe that draws the flag down to be the plaything of faddists. You cannot paint the lily-of-the-valley, nor can you beautify the rose of Sharon. And no more can you grace the American Flag with furbelows.

To naval officers, accustomed, during a life-long service to the country, to pay daily obeisance to the flag floating over their heads with all the reverence of a lover to his sweetheart; actuated in the performance of duty by the constant prick of pride in his ship and realizing that any faulty appearance of the national colors signifies, to seamen, an ill-conditioned man-of-war not tolerated in any well-disciplined navy in the world; reminded by the Articles of War that court-martial and death await the man "who shall not do his utmost to uphold the honor of the flag," a scene that occurred in New York, on Flag Day, 1921, appeared most pitiful. There, on a day set apart by the National Legislature for special honors to the flag, was hung, in the dome of the City Hall, a number of so-called national flags bound with yellow and giving the appearance of a mass of goldenrod, the yellow tint outranking and veiling the tri-color ordained by the American people to represent unity, liberty and concord, and yet they had no thought or purpose of committing, or permitting without protest, a "yellow" act of any kind. At the same time there was taking place on Broadway a parade of several thousand school children, who were being taught to pay proper respect to their country's flag; but in that mile-long column of young Americans only one

really American flag was visible. It, at best, was nothing but a small toy flag showing the traditional colors authorized by Congress to represent the Nation, partly stripped from its slender staff, the glorious stars of the Union hanging upside down—the seaman's signal of distress—giving the appearance of being ashamed of its being seen in the long line of mud-color, which dominated the procession. The sight brought more than one invective against that yellow streak. Is such a picture of sailing under false colors a fitting object-lesson when calling children to "Rally Around the Flag?" Then, paraphrasing the greatest songster of flag literature:

Tear down that mottled yellow streak,  
Too long has it waved on high;  
And many an eye has dimmed  
To see that jaundiced color fly.

And let there appear to your minds that divinely painted picture, that only a sailor afloat upon a tropical sea may view when at the close of day, with tender thoughts in his mind of dear ones at home, whom he is protecting on the first line of defense, there appears Old Glory at the masthead of some passing vessel rising higher and higher in the skies, while the setting sun, dipping its golden head below the distant horizon, mingles its expiring rays of effulgent streamers with those of the beautiful flag he loves; the scarlet red coming out of the west, reflected along the white crested waves of the sea, all scintillating under the fading lights of a star-lit dome of Heavenly blue.

Red stripes and white for strength and right,  
Speed on thy message, speed!  
Guard that blue strain of Heavenly light,  
Thine starry field with visions bright,  
To meet a nation's need.

Viewing such a scene as this there will surge through every fibre of your bodies that electric wave of patriotism, which Roosevelt once described, that will spring forth from the depth of your very souls, in ever-swelling tones—"Three cheers for the Red, White and Blue."

NOTE: Delivered before the District of Columbia Society Sons of the American Revolution; and the Military Order of the Loyal Legion of the United States.



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## THE GENERAL BOARD

### A SKETCH

By REAR ADMIRAL RICHARD WAINWRIGHT, U. S. Navy

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The name General Staff is very much under a cloud at present because of the influence of the German General Staff in precipitating the late World War and its barbarous method of conducting it.

A General Staff is only an organization of military experts formed to carry on the business of war. Any large business, unless it has experts to conduct it, must lack in efficiency and where only backed by private money must prove a pecuniary failure. Our railroads, long governed by experts in transportation, are now showing the results of experiments with expert financiers at their head. Some of our colleges are trying the same experiment. The results may not be apparent yet, but the cause of education will prove the loser in the long run. An Army or Navy may win success even when its affairs are conducted by amateurs, but the cost in lives and property must be enormous. A review of the costs of our wars from the first to the last will show how much could have been saved if the preparation and execution had been in the hands of experts.

Such an organization as a General Staff may become a danger to its own country and to the peace of the world when its immediate head is a paranoëc backed by a military aristocracy and by a people who are indoctrinated with the belief that broken faith and cruelty are not wrong when they benefit the country.

With our government as organized and with the general sentiments of our people, there is no danger of militarism. The civil element always should and always will dominate and the military experts will always have to struggle for reasonable preparation and against amateur interference in the conduct of war. It is im-

portant to the safety and welfare of the country that the governing machinery for Army and Navy should be as efficient as possible and the most efficient machine so far developed is that of a General Staff. The administrative and legislative bodies control the policy of the nation and the military and naval experts under them control the military policy that is required by that of the nation.

The General Board was established by order of the Secretary of the Navy, John D. Long, on March 13, 1900, General Order No. 544, as follows:

A General Board is hereby established, to be composed of the following named officers: The Admiral of the Navy, the Chief of the Bureau of Navigation, the Chief Intelligence Officer and his principal assistant, the president of the Naval War College and his principal assistant, and three other officers of or above the grade of lieutenant commander.

Should the principal assistant of the Chief Intelligence Officer, or the principal assistant of the President of the Naval War College be below the rank of lieutenant commander, an officer or officers of the grade of lieutenant commander or above will be designated to fill such place or places on the Board.

The purpose of the Department in establishing this Board is to ensure efficient preparation of the fleet in case of war and for the naval defense of the coast.

The Chief of the Bureau of Navigation will be the custodian of the plans of campaign and war preparations. He will indicate to the War College and Intelligence Officer the information required from them by the General Board, and in the absence of the Admiral of the Navy, he will preside at meetings of the Board, and exercise the functions of president of the Board.

The Board will meet at least once a month, five of its members constituting a quorum, and two of its sessions every year shall extend over a period of not less than one week each, during which time the Board shall meet daily.

Accordingly, on March 29, 1900, Secretary Long ordered the following officers who constituted the first membership of the Board:

Admiral George Dewey, Senior Member;

Rear Admiral A. S. Crowinshield, Chief of Bureau of Navigation;

Captain C. D. Sigsbee, Chief Intelligence Officer;

Lieut. Comdr. R. T. Mulligan, Asst. to Chief Intelligence Officer;



Captain C. H. Stockton, President Naval War College;  
Captain Asa Walker, Asst. to President Naval War College;  
Captain R. D. Evans,  
Captain H. C. Taylor,  
Captain C. E. Clark,  
Captain F. E. Chadwick, and  
Colonel Geo. C. Reid, U. S. M. C.

On April 14, 1900, Lieutenant Henry H. Ward was ordered to duty as Secretary of the Board.

On April 16, 1901, the original order (G. O. 544) was modified by General Order No. 43, which read as follows:

General Order No. 544, of March 13, 1900, republished in General Order No. 1, of June 30, 1900, is so far modified that the General Board will be composed of the following named officers:

Admiral George Dewey, President  
The Chief of Bureau of Navigation  
The Chief Intelligence Officer  
The President of the Naval War College, and

Such other officers of or above the grade of lieutenant commander as the Department may designate.

This remained the composition of the Board until the adoption of the "Aid" system in the organization of the Department, when the Chief of the Bureau of Navigation was omitted, and the Aids for Operations, Material, and Personnel became members, ex-officio.

When these offices were abolished the Chief of Naval Operations became an ex-officio member, and later the Major General Commandant of the Marine Corps was added as an ex-officio member.

It was due largely to the efforts of then Captain, afterwards Rear Admiral, Henry Clay Taylor that the Navy owes the creation of the General Board. Early in his career he commenced the study of war and he continued an ardent student until his untimely death. Before the Spanish War he was President of the War College. He commanded the *Indiana* during that war and was among the first members of the General Board; afterwards, as Chief of the Bureau of Navigation, he was able to further his ideas which were concentrated on a General Staff. To him as much if not more than any one else we owe the persistent attempts to have

naval affairs controlled by naval experts. Well he knew that the General Board was only a step in the right direction.

To Lieutenant Commander T. B. M. Mason and Commander, afterwards Rear Admiral, B. H. McCalla we owe the establishment of the Office of Naval Intelligence, a most necessary section of any form of a General Staff. Mason laid the foundations of the Office broadly and firmly. It immediately became of value to the service and has grown in value and importance with the growth of the Navy. As the nation gradually awoke to the necessity of a navy, the Office of Naval Intelligence furnished information of foreign material and enabled us to benefit by the experience of other countries. War plans were also included in the duties of the Office and with our then decrepit fleet the plans dealt more in things hoped for than in existing force. The Office of Naval Intelligence was the first step in the direction of organized preparation for war. The next step was the War College; its establishment we owe to Rear Admiral S. B. Luce, who urged its establishment, was its first president, afterwards lectured there and was always ready with his aid and advice until the end of a long and honorable career. The Navy owes much to his continuous efforts to promote the study of war and to forward the idea of the control of the affairs of the fleet by naval experts.

For many years the classes at the War College were little more than conferences of officers fresh from the fleet, directed in their studies by the College staff and instructed by lecturers on war and diplomacy, the most eminent of these being Admiral Mahan, whose lectures on Sea Power were highly valued by all seagoing peoples.

There were few students of war in the Navy when the College opened and for some years the lessons that could be drawn from the fleet were of little value; the staff and students had to study the tactics and maneuvers of other naval powers and to draw upon their imaginations for future fleet operations on our coast. The use of tactical and strategical games was slowly developed while the students were guided in their reading of the old masters of the art of war and their studies of former battles, both naval and military. The fleet grew in size and quality, and as the knowledge of war was disseminated by the College students, the exchange of

theories from the College with experiences from the fleet became valuable and the study of tactics and strategical plans required less exercise of the imagination and a closer attention to facts. Logistics, tactics and the application of strategy to the war games became less theoretical and more practical.

Prior to the blowing up of the *Maine* but when war with Spain seemed only a question of time, the Department instituted a Defense Board upon the urgent request of Admiral Taylor, then President of the War College. The members were the Commander-in-Chief of the North Atlantic Fleet, the Chiefs of the Bureaus of Navigation and Ordnance, the President of the War College and the Chief Intelligence Officer. Both the War College and the Office of Naval Intelligence presented studies or plans for the war with Spain, at the first session of the Board. Under the direction of the Board and under the immediate eye of the Commander-in-Chief, plans were prepared in the Office of Naval Intelligence and were approved by the Board. They were corrected from time to time, but for lack of any central naval authority became obsolescent before the advent of war.

There was another Board, some of whose functions were taken over by the General Board. Soon after we commenced to build a real fleet, the Department constituted a new Board. The Board on Construction consisted of the Chief of the Bureau of Ordnance, the Chief of the Bureau of Equipment, Chief of the Bureau of Steam Engineering, the Chief of the Bureau of Yards and Docks, the Chief of the Bureau of Construction and the Chief Intelligence Officer. They recommended to the Department the military characteristics of all new vessels. Each Chief of Bureau was deeply engaged in the immediate work of his own specialty and they had little time to devote to the general consideration of the plans for a well balanced fleet. Besides they were very careful how they opposed each other's ideas, as each one wanted the votes of the others for his own special ideas. The decisions of this Board were not always approved by the Secretary. Once when the issue was the plans for several new torpedo boats, the military members all decided to adopt plans similar to a British type, the largest then built, that had proved quite successful and was somewhat larger than any we had attempted. The Chief Constructor wanted to

adopt a much smaller boat after a French design, one purely experimental and one the designer admitted had been built as an experiment to obtain speed in a small boat without serious consideration of other military factors. The Chief Constructor took his minority report to the Secretary and obtained a decision in his favor by the argument that as torpedo boats were sneak boats, the smaller they were the better they could sneak upon the enemy, and all questions of seaworthiness, endurance or armament were brushed aside. It was only by the great influence of Admiral Sampson, then Chief of the Bureau of Ordnance, that the Secretary was induced to reverse his first decision and make a 50-50 one. The big boats proved good for their time; the small ones proved a failure and were called the Bath Tubs. Although well constructed at Bath, the design was a failure. Thus was money wasted and progress retarded by the decision of a civilian who lacked the groundwork of knowledge upon which to found his decision.

The General Board took under consideration questions of naval policy, the size and composition of the fleet, the military characteristics of the various types, the numbers, etc., of the personnel, war plans, as well as many minor questions that from time to time were referred to it by the Department. The Board had no executive functions and was limited to advising and reporting to the Secretary, and its advice and reports were held confidential except when it was desired to gain popular support to some plan of the Department when a report of the General Board was quoted in its favor. It was more the knowledge that Admiral Dewey was the President of the Board that gave any weight to its decisions than any public knowledge of the composition and workings of the Board. Even such a report did not always do full justice to the Board, for at times the document quoted would be in direct reply to questions from the Department that were so prepared as to limit a free expression of opinion. One was often reminded of the story of the creation of the Charleston Navy Yard. A Board was ordered to investigate and report on two sites for a Navy Yard, one at Charleston and one at Port Royal, as to which was the better. This Board reported that Charleston was the better site, but urged weighty objections against both of

them. The report of this Board was used to secure the necessary legislation, only the weighty objections were omitted and another log was rolled.

The work was divided between the regular members, who formed heads of committees to consider the subjects under their charge, and from time to time they met together as an executive committee and prepared matter for the consideration of the full Board, or as occasion required an emergency report for Admiral Dewey's signature.

The size and composition of the fleet with the military characteristics of each type required much discussion and long consideration, and a report was sent to the Department some time prior to the time when the Secretary made his annual report. As the Government has never adopted any naval or military policy, the General Board, in its considerations of the subject, generally considered the correct naval policy, for the time prior to the late war, to be a fleet sufficient to render a successful landing of any possible enemy on our shores practically impossible. Under this policy, it was necessary to have a fleet greater in strength than any power with sufficient military organization and sufficient transportation to land an expeditionary force of a size to give reasonable expectations of success. Prior to the late war our army was so small as to make the size of such a force within the power of two military nations, Germany and Japan. The question of two fleets for two oceans was very important prior to the Panama Canal; the completion of the canal modified the difficulties.

The Board was obliged to consider the effect of their report upon the Administration and not to attempt to obtain everything necessary at once. Rarely if ever were the necessities of the Navy, as reported by the General Board, met by legislative appropriation until the very large program of 1916, advocated by Mr. Daniels, met with the approval of Congress, and such is fate, this was at a time when all our efforts should have been devoted to turning out craft fitted for anti-submarine warfare. Usually the recommendations of the Board were returned with directions to report on what could be best spared so as to cut down the appropriation.

The recommendations of the Board as to military characteristics have generally met with a better fate. These recommendations,

made after conferences with the Chiefs of the Material Bureaus, were usually adopted. One year the size of the battleships was materially reduced because of the weight of opinion of some small ship advocates with an influential Senator. Once the after-cage mast was placed between funnels, but this absurdity was never repeated. In accordance with the recommendations of the General Board, as advised by the principal naval experts in Construction, Engineering, Ordnance, etc., the designs of American battleships have gradually increased in size and in weight of armor and armament. Turrets have been maintained on the central line in spite of foreign examples of broadside and wing turrets, and the principle of tall and short turrets has been adopted. Propulsion has gone from reciprocating to turbine engines and now to the electric drive, and we have also led in the adoption of fuel oil. We have gone from 12-in. to 16-in. guns with corresponding armor protection.

For at least thirty years American battleships have had greater military efficiency than their foreign contemporaries, except for the Dreadnought. That Americans did not build the first all big gun battleship was not the fault of American designers. The all big gun principle had been ably presented to the General Board and sketch designs of the U. S. S. *Possible* had been exhibited, but it was not the policy then of the General Board to rival the "greatest navy in the world" in size of battleship, only to get a little more battle efficiency on the same tonnage. It is doubtful if it was to Great Britain's advantage to so force the race for size and power by building the Dreadnought for, as it placed in the background, if it did not render many of her fleet obsolete, it made it more difficult for her to keep her preponderance in sea force over her great sea rival, Germany. With the advent of the Dreadnought, as Germany would follow, it was necessary for America to build Dreadnoughts and Superdreadnoughts; and it is not from want of recommendations and urgent reports that America has not always led Germany in number of capital ships as she has done in their design.

As to armored cruisers and battle cruisers, we have always been behind in the race. The latter we have just commenced to build. While our fleet was small their necessity was not so apparent and

appropriations being limited, battleships were recommended as being most necessary. As there has always been a sentiment for many small ships against a smaller number of large ones, so there has always been a sentiment against sacrificing armor and armament for speed and against building a due proportion of battle cruisers in place of all battleships. This sentiment has been more difficult to reason down than the one for small ships and it was not until the 1916 program that appropriations were made for battle cruisers. War was then inevitable; now that the war is over, the battle cruisers are slowly building.

The General Board early set a standard of four destroyers to a battleship. Of course, that is far too few for present warfare with modern submarines, but too many to suit legislative ideas. In design we were generally a little behind our rivals in speed, but our Constructors and Engineers, backed by the Board, held out for heavier scantling and larger parts than were usual abroad. Certainly they were justified in the late war when their superior sea-keeping qualities were manifest.

Although submarines were an American invention, we were backward in developing them and we had not reached a very useful type when we went into the war. It was only through the great energy and pluck of our young officers that the best of ours were made useful. The General Board was not urgent to build large numbers of these as a fleet type had not been developed. It was evident the design was capable of improvement and recommendations were made to carry out the wishes of the enterprising young officers who were familiar with the practical workings of the submarines, as far as the designers and builders consulted by the Board thought possible.

Airplanes were in their infancy and were being slowly developed prior to the war. The rapid development of submarines and airplanes during the war caused some to forget the great cost in life and treasure as well as the enormous interests involved that served to produce this rapid increase in efficiency. When certain results have been reached, the General Board is accused of conservatism because they have not recommended the earlier adoption of an imperfect weapon. Public sentiment and even public welfare prevents the rapid development of weapons of warfare

where such development must be at the cost of life and large appropriations, and it is wise to provide for the use of the old and well tried instruments until the new have been perfected sufficiently to be relied on in war. Admiral Fiske, writing on the defense of the Philippines, states that he had recommended that reliance for their defense be placed in airplanes. This was made at a time when the efficiency of the plane, even as a scout, was all to be developed in the future. One is reminded of Admiral Sir Percy Scott, the great prophet of the submarines. Both Admirals have rendered important services to their respective countries, both have large imaginations and are gifted with a prophetic *flair*, but their advice for present, everyday work has not always been the best. Prophecies of the future are not always the best foundation for present needs. Had this character of advice been followed, our destroyers would have been some time without torpedoes while the ten thousand yard torpedo was being developed and the shore of the Philippine Islands littered with wrecks of imperfect airplanes. To prophesy for the future the head may be in the clouds, but to provide for the present the feet must be firm on the ground.

If one searched the records, there would be few years found in which the General Board failed to recommend an increase in the personnel of the fleet and to urge the importance of trained men to man the ships composing it. It seemed difficult to believe that men could not be found when the emergency arose, if the ships were ready. Even now, after the experience of the war, appropriations are made to build more ships while the personnel provided is insufficient to man efficiently the present fleet and the fuel allowed insufficient for their proper training.

The General Board recommended a scheme for a Naval Reserve that would have proved of considerable value when mobilizing for war, but it failed of adoption. It made many recommendations as to the promotion of officers and with the aid of Captain Roy Smith perfected a scheme for selection out that if adopted might have proved more efficient and less unpopular with the service than the present system that is now under revision by the Department.

War plans were the constant study of one committee of the General Board and from time to time the results of these studies



were considered by the full Board. From time to time portions of the plans were given to the War College for consideration and report. This custom arose when the permanent staff of the College was not greatly pressed by work during the winter and the summer sessions were largely conferences of a body of officers fresh from the fleet; but when the College was developed into a real school for instruction and the work continued through both summer and winter, all work on war plans was withdrawn from the College.

It has been said that there were no war plans. These plans were revised from time to time and kept up to date. They were as complete as existing knowledge permitted and, where large policies were involved, received the approval of the Department. The plans were more or less incomplete; it must be remembered that there is danger of limiting the initiative of the Admiral Commanding with too complete game board plans. The completeness of the first von Moltke's plans for war with France have been misunderstood. They were no doubt most complete, but von Moltke was too great a war genius to limit the initiative of his generals by interference with their minor strategy or greater or minor tactics. When Mr. Daniels was asked by the Hale investigating committee for the General Board's plan for the war, he answered "Search me." *After his departure from the Department, his desk was searched and the plans found*; and it is safe to assume that had this plan been followed many things would have been undertaken at once, that either never were started or were undertaken some time after we entered the war on paper. At least there would have been less grounds for the serious strictures on the administration of the Navy made in the very valuable report of the above-mentioned committee.

The General Board recommended the abolition of a number of our Navy Yards and the building up of several Naval Bases, where the fleet could dock, repair, re-fuel and equip, but during the orgy of spending inaugurated by the war the yards were expanded and the Navy drawn into a riot of shipbuilding. There is no doubt that this expenditure is being curbed by the present Secretary and if the Council to consider the limitation of armament is as successful as all good citizens hope, there will be much

machinery at all the yards that we will find it difficult to dispose of before it becomes obsolete.

New weapons have arisen and new means have been found to handle them and to provide against them. So many refuse to believe that "the best prophet of the future is the history of the past." For all time he who uses demonstrated facts to guide his footsteps will be called radical by the conservative and called conservative by the radical. We now have a prophet who declares that troops can no longer be carried across the seas and it is only a few months since we sent two million men to France with but negligible loss from shore to shore. The cry during the war was that the methods of warfare were new and required new men for generals, men who were not imbued with old military ideas. Yet the great general of the war, the one who was uniformly successful, was a thorough student and a luminous teacher of military lore; and when given the necessary power Foch, at his first opportunity, took advantage of the Germans' often-repeated error and, holding them in front, struck them in the flank, and the Germans were being driven to colossal disaster when Foch's forces were arrested by a politicians' armistice.

A Joint Board composed of officers from the General Staff of the Army and the General Board of the Navy was a slight approach toward a Grand General Staff. It was created to advise the President on weighty matters and to co-ordinate the work of the Army and the Navy, and it did some good work, but its work was stopped when we were being kept out of the war.

The Aid system, adopted by Secretary Myer, was a further advance toward a General Staff and the Aid for Operations took the place of the Chief of the Bureau of Navigation on the General Board. The advice of the Board was put into operation by the Secretary of the Navy through the Aid and if legislation was necessary was urged upon Congress. The Aids with the General Board and the Office of Naval Intelligence formed a species of General Staff incomplete in many ways, but the best that could be adopted at the time without legislative sanction, and it was hoped would lead to the creation of a real General Staff. The needs of the fleet were considered paramount and the value of the Navy Yards was weighed in accordance with their importance to

the fleet. Conflicting interests of the several bureaus were reconciled and adjusted and the reports of experts were studied and put in shape for the Secretary's consideration.

The next move was a step backward. The Aids were abolished and the Office of Chief of Operations was created by Congress. Unfortunately the Chief of Operations became under the law only one of several bureau chiefs; he lacked the power of a real Chief of Staff to co-ordinate the work of the bureaus. A council of bureau chiefs met, with the Secretary presiding, and the needs of the fleet were settled when a glib tongue might outweigh expert knowledge.

The General Board has aided in keeping alive the spirit of a General Staff and has supplied the need of it as far as its limited authority would permit. With a real General Staff established, a General Board, untrammelled by executive duties, considering and reporting on larger questions of naval policies would be of assistance to any Chief of Staff and would help to protect him from the annoying assaults of Galley Yarns.

It is to be hoped that we may yet have a real General Staff for the Navy; but it must be remembered that a Pershing can make a General Staff but a General Staff cannot make a Pershing; and the General Staff must refrain from attempting to keep the Admirals of the fleet in swaddling clothes.



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## THE ESSENTIALS OF THE RADIO-COMPASS

By LIEUT. JOHN E. WILLIAMS, U. S. N.

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The radio-compass, when it has become more thoroughly understood by the naval service at large, will prove a vital element of naval strategy. Many excellent articles covering various phases of the radio-compass have already been published, but an exposition that will set forth the simple theory underlying this instrument is needed to clear away the doubts entertained by many officers as to its practicability on board ship, and to banish the bugbear of how to use it.

During the World War this instrument, in a modified form, was used extensively, with excellent results, by both the British and French, to locate ships at sea. Its use required but about one minute of transmission by the ship, and about ten minutes more for plotting and coding by the shore stations. At the end of this time the ship's position was sent broadcast in code. As a matter of interest, it may be noted that on several occasions, our own destroyers, in position approximately two hundred miles off the west coast of Ireland, have checked the accuracy of these radio-fixes by simultaneous starsights, with an average resulting compass error of about five hundred yards. Since the Armistice, a method similar to that of the British has been perfected by the U. S. Naval Radio Service and is now used by our navy with ever-increasing confidence.

One cruise of the U. S. S. *Edwards*, from San Francisco to San Diego, may be quoted as significant of the reliance which may be placed on the radio-compass. Taking departure from the light ship (San Francisco) at noon Feb. 9, 1921, and cruising through continuous fog, a course was set well to seaward for safety. Dead reckoning was carried forward allowing for the set and drift of

seasonal currents. At about 4:00 A. M., Feb. 10, and well to the westward of Santa Barbara Island (about 30 miles) the course was changed to pass Santa Catalina Island two miles abeam to starboard. A continuous check by radio-cross-bearings from shore stations had been maintained, and these radio-fixes checked the dead reckoning position within a quarter of a mile at all times. Both were verified as correct by subsequent forenoon and meridian sunsights, as well as by cross-bearings on Santa Catalina Island.

As a further example of the application of this instrument, the U. S. S. *McCall*, equipped with a home-made Bellini-Tosi direction finder, adapted to unit direction, and essentially the same as the present day radio-compass, was, on May 26, 1918, able to make contact, through a fog, with the 14,000 ton freighter *Rathlin Head* which had been torpedoed in both the engine and firerooms as well as in the forepeak. By her timely arrival the *McCall* was able to force the submarine to submerge, and successfully salvaged the *Rathlin Head*, escorting her, under tow, to Bantry Bay, a distance of one hundred and twenty miles. In order to render the use of the radio-compass more general, and duplicate in everyday cruising the foregoing results, it is desirable that *officers in general* become familiar with its theory, for only by mastering the theory may the use of the radio-compass on shipboard be made reliable. Once the essential details have been mastered, however, the operation of the radio-compass becomes simple and inherently accurate, and it is the endeavor of this article to make clear these essential features by considering the chief factors entering into its construction, in their logical sequence: (1) The action of a stone thrown into a pool of water, as similar to the propagation and characteristics of the radio wave; (2) The stress set up in ether by the charged transmitting antenna, together with its characteristics; (3) A brief consideration of the electric generator principle, as applied to the exploring coil of the compass; (4) An investigation of the properties of the closed loop (or exploring coil) with its vector curve of signal strength; (5) The signal strength of a vertical antenna as a vector quantity; (6) The vector combination of the loop and vertical antenna when used to obtain unit direction; and (7) Probable errors, to be met in the use of the radio-compass, and their elimination.

Consider a stone, thrown into a pool of still water. It would be hard to find a man unfamiliar with the series of concentric circles radiating from the center of disturbance. Now consider yourself located at a point P (Fig. 1) on the instantaneous circumference of one of these circles, and let it be required to find the direction of the center of the disturbance "C." A simple geometrical solution at once presents itself. Draw a line A P B tangent to the circle at P, and construct a line P Q normal to A P B at P. This normal, then, passes through the center of disturbance "C." The application of this principle will be evident when the action of the loop antenna is considered later.

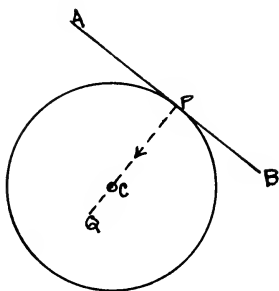


Fig. 1 A

Proceeding from water to ether as a medium for the transmission of energy, and from the stone to the transmitting radio-antenna as a source of energy, one is interested to note the similarity that exists between these two. Experiment has repeatedly verified the theory that radio energy as it exists in the form of ether stress is similar to the propagation of sound, heat, and light energy in the form of wave trains through the same medium. It has further been determined that these energy wave-fronts exhibit themselves as loci of spherical surface of constantly increasing radius, and, further, that in the case of the radio train the velocity of this surface away from the source of energy is  $3 \times 10^8$  meters per second. In ether as in the case of the ocean wave, the individual particles do not move appreciably forward, but rather, oscillate in a minute elliptical path, transmitting their

energy from particle to particle and forming in water the familiar, visible wave on which a floating cork will move up and down but not forward. Each wave has its crest (maximum amplitude), its trough (minimum amplitude), its node (a point vertically halfway between the crest and trough), and its wave length ( $\lambda$ ) equal to its forward velocity divided by its period. Again, the wave train in ether may also be likened to a violin string set in vibration by a bow. This string has nodes of zero motion and loops of maximum motion. If its limiting positions were to be projected on a vertical plane, it would be evident that its vibration had taken the form of a sine curve rotated about its neutral axis. For a string of given length, the vibration travels along the string at a certain velocity, and the nodes of zero vibration maintain a fixed position (harmonics). So the particles composing the radio wave train have the same properties as those of the ocean wave as well as the effective properties of the violin string. The wave front moves forward (rate of propagation) with the velocity of light, the space interposed between the source of energy and the wave front is under tension, the distance from trough to trough is equal to the wave length, and the time, in seconds, necessary for succeeding troughs to pass a given point is equal to the wave length in meters divided by  $3 \times 10^8$ .

Like the violin string, this alternately expanding and contracting radio-wave-stress-in-ether is composed of two stresses (Fig. 2) at right angles to each other and mutually at right angles to the direction of the forward motion of the wave-front along any particular radius. The vertical stress is an electro-static stress which does not materially influence the present subject. *But the horizontal or electro-magnetic stress is the foundation on which the theory of the radio-compass is based.* Since we are considering a variable magnetic-stress it is convenient to regard it in terms of the value of its instantaneous flux, which, in turn, is proportional to the instantaneous amplitude of vibration of the wave front, and is conveniently expressed by the ordinate " $\phi$ " of the sine curve (Fig. 3.) This value " $\phi$ " is in phase with the transmitting oscillation.

In order to connect this magnetic flux with the compass loop, one need only remember the principle of the familiar electric



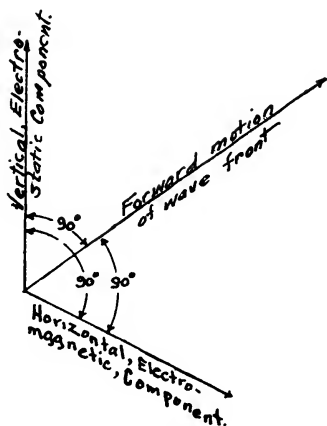


Fig 2

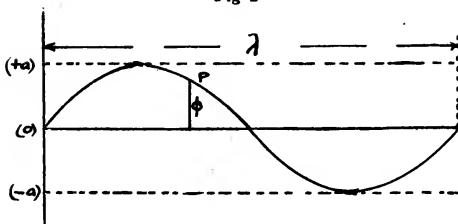


Fig. 3

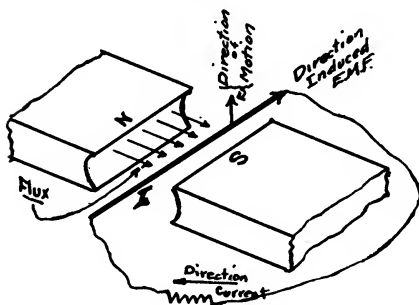


Fig 4

generator, where an inductor "I" (Fig. 4.) is moved upward through a magnetic field of flux " $\phi$ ". The induced E. M. F., and current will be proportional to the rate at which the lines of magnetic flux are cut, and the current will flow in the direction indicated (Fig. 4). It is at once evident that the same results would obtain if the inductor were held stationary and the magnetic field moved downward with the same velocity. This latter arrangement is what occurs in the radio-compass, with the single exception that there the magnetic field moves forward with uniform velocity instead of vertically, and that the strength of the field (as shown by Fig. 3.) is variable. The stage is now set to consider the simplest form of the radio-compass, i. e., the loop antenna or exploring coil.

The simplest form of the radio-compass and in its simplest case consists of a closed loop (Fig. 5.)  $E_1E_2E_3E_4$  in whose circuit a

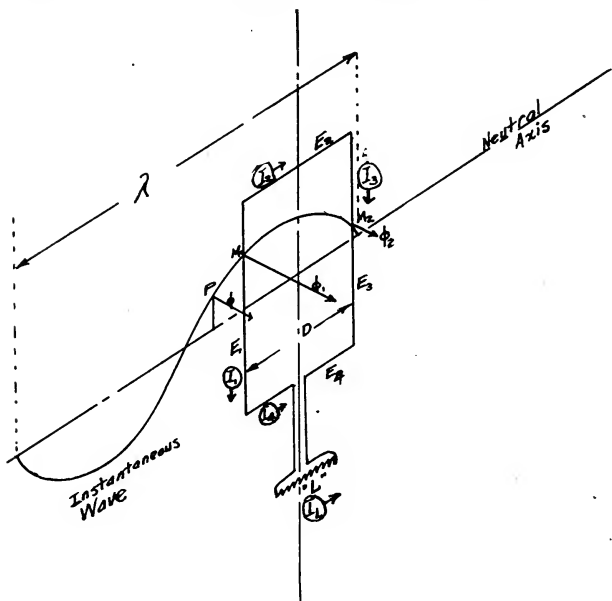


Fig. 5

load "L" is inserted. This loop is set on a vertical axis and is rotated until its plane contains the vertical trace of the incoming radio wave. Let  $E_1$ ,  $E_2$ ,  $E_3$ ,  $E_4$  represent the EMF's induced in the legs of the coil, and let it be understood that upon the properties of these several EMF's depends the action of the compass itself. Let the horizontal dimension of the loop be "D" meters. Now from a consideration of the velocity of the wave it

is evident that any point "P" on the wave will cut  $E_3$ ,  $\frac{D}{3 \times 10^8}$  seconds after it cuts  $E_1$ . Now superimpose an *instantaneous* section of the wave on the plane of the loop, and let  $M_1$  and  $M_2$  represent the successive positions of any point "P". Then the instantaneous values of magnetic flux  $\phi_1$  and  $\phi_2$  (assumed to right for positive ordinates) will be proportional to the ordinates  $M_1$  and  $M_2$ , and in turn represent the "rate of cutting" of  $E_1$  and  $E_3$ , (since they are perpendicular to the plane of the loop). The direction of current, by the corkscrew rule, will be downward. Hence if current be represented by the same subscripts as the induced EMF's, then  $I_1$  and  $I_3$  will buck each other. A similar consideration will make it evident that  $I_2$  and  $I_4$  buck each other and flow from  $M_1$  to  $M_2$ .

We are, however, directly interested only in the resultant current  $I_L$  through the load, and an inspection of the figure shows that  $I_L = I_1 - I_3 + I_4 - I_2$ . Now in the case of  $I_4$  and  $I_2$ , the instantaneous value of the rate at which  $E_4$  and  $E_2$  are cut by the flux is the same for both (since their midpoints are in the same vertical line), and for this reason  $I_4 = I_2$  and  $I_L$  is reduced to the expression  $I_L = I_1 - I_3$ . Since  $E_1$  and  $E_3$  are separated by the

distance "D" their EMF's  $E_1$  and  $E_3$  differ in phase by  $\frac{D \times 360^\circ}{\lambda}$ ,

and the expression  $I_L = I_1 - I_3$  is a real value, and is a function of the distance separating  $E_1$  and  $E_3$ .  $I_L$  is a maximum when D is a maximum and becomes zero when D becomes zero. This shows that the maximum value of  $I_L$  for a given separation, (D) occurs when the conditions of Fig. 5, are realized.

In order to investigate the general case, consider the loop of Fig. 5., revolved through an angle  $\Theta$  (Fig. 6). The separation of  $E_1$  and  $E_3$  then becomes  $D' = D \cos \Theta$  and the resultant current,

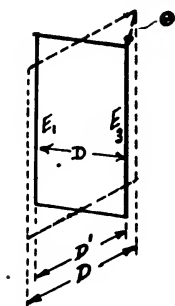


Fig 6

$I_L$ , which is a function of  $D'$  (general position) may now be exactly expressed by the equation  $I_L = k \cos \Theta$ , where  $k$  is a constant, determined experimentally for the loop in question. This, ( $I = k \cos \Theta$ ), is the polar (vector) equation of a circle whose center is displaced a distance  $\frac{k}{2}$  from the polar origin, (Fig 7). This circle traces itself completely from  $\Theta = 0^\circ$  to  $\Theta = 180^\circ$ , and retraces itself in the same direction from  $\Theta = 180^\circ$  to  $\Theta = 360^\circ$ . There are, then, two maximum values, one at  $\Theta = 0^\circ$ , and one at  $\Theta = 180^\circ$ . There are two zero values, one at  $\Theta = 90^\circ$ , and one at  $\Theta = 270^\circ$ .

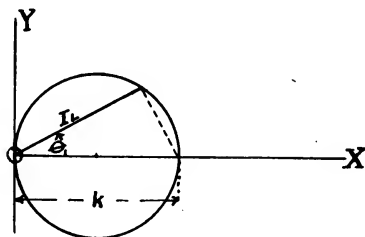


Fig. 7

If now a telephone receiver, in conjunction with a suitable radio receiving set, be substituted for the load "L", a signal will be heard. This signal will be a maximum when  $\Theta = 0^\circ$ , or  $180^\circ$ , and

will be zero when  $\Theta=90^\circ$  or  $270^\circ$ . The natural question, "What does all this prove?" may be answered by calling your attention to Fig. 1, and pointing out that the center of the loop is the point "P", that the electro-magnetic stress component of the radio wave

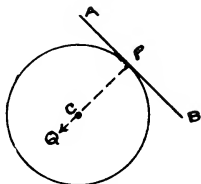


Fig 1

is the tangent A P B, that the plane of the loop contains the line P Q (the normal to the tangent at its point of tangency), and that this plane, continued, passes through the source of disturbance (the transmitting antenna). But it will be noted that we have obtained a line of position and not an absolute direction

It is possible, however, to obtain an absolute direction by the addition of a vertical antenna. This vertical antenna is located on the axis (extended) of the loop, hence the instantaneous flux cutting it is the same as that considered for the loop, and its phase is the mean of  $\phi_1$  and  $\phi_2$ . A suitable receiving set utilizing a vertical antenna is characterized by a signal of constant strength, irrespective of the course of the ship, and the equation of its current is  $I_V=K$  (a constant), which is the polar (vector) equation of a circle of radius  $K$  whose origin is at the center (Fig. 8).

In order to form a combination of these two curves, ( $I_V=K$ ;  $I_L=k \cos \Theta$ ), we resort to the simple expedient of coupling these two currents inductively. The loop forms a load in the secondary of a receiver (Fig. 9.) whose primary is connected to the vertical antenna and to ground. The coupling is adjusted until  $K=k$  (method will be explained later), and from a consideration of the two equations it is evident that the resultant current  $I=I_L+I_V=K+k \cos \Theta$ . And since  $K=k$ ,  $I=K(1+\cos \Theta)$  which is the polar (vector) equation of a cardioid, which has only *one* value of  $\Theta$  ( $=180^\circ$ ) corresponding to a zero

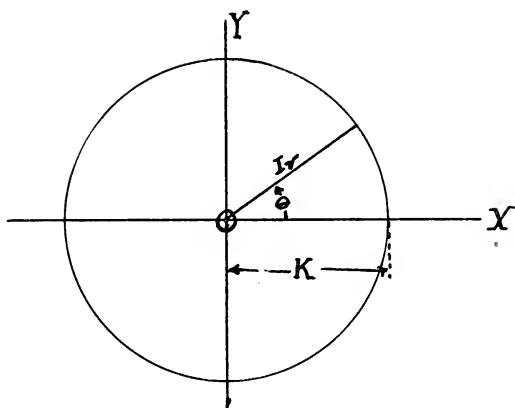


Fig 8

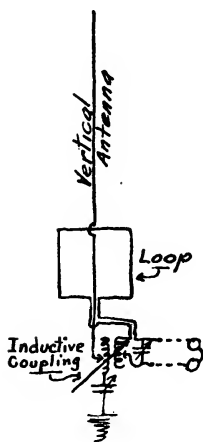


Fig. 9

value of  $I$ . This resultant curve is shown in Fig. 10, where, since we now have but one position of zero current (or zero signal), we have eliminated one of the bilateral directions of the original line of position, and have obtained the absolute direction (unilateral) of the source of disturbance (the transmitting antenna).

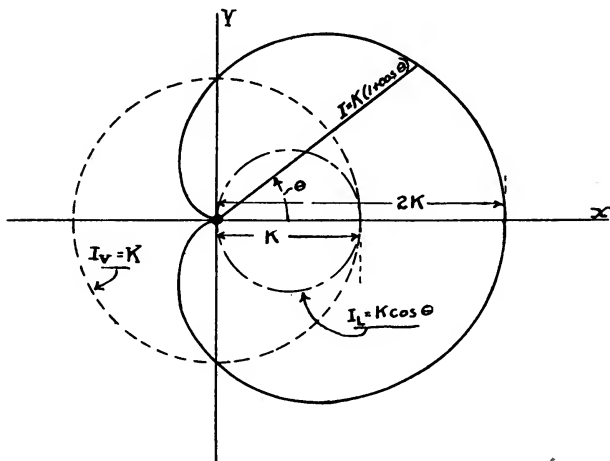


Fig. 10

Though the explanation of the cardioid may seem complex, the practical application is simple. In order to obtain this cardioid it is necessary to make big  $K$  equal to little  $k$ . This is accomplished in the following manner. (1) Tune both the primary and secondary to agree with the incoming signal. (2) Open the primary circuit and note the maximum signal strength resulting from the loop alone. (3) Rotate the loop through  $90^\circ$  (to zero signal strength). (4) Close the primary circuit and adjust the coupling until the signal strength resulting from the primary (vertical antenna alone) is equal to that which was heard when the loop *was* in its position of maximum signal strength. You have now adjusted the instrument to satisfy this requirement.

Inasmuch as it has already been shown that the action of the radio-compass is based on a magnetic flux, it will readily be

appreciated that errors similar to the variation and deviation of the standard magnetic compass may be expected. Variation, resulting from the deflecting action of metal deposits along the path of the wave, is reduced to a minimum at sea and may be safely neglected. On the other hand, the radio-compass is very sensitive to deviation resulting from the local arrangement of metal as well as of long conductors whose natural wave length closely approximates the incoming wave. The metal mass deflects the wave from its true path by magnetic influence, while the long conductors re-radiate the energy absorbed from the original wave and become new sources of disturbance, thereby giving false readings. The deviation due to metal masses is compensated by swinging ship for original errors, plotting a curve of these errors for use in subsequent observations, and maintaining the disposition of metal in the vicinity of the compass loop as nearly constant as possible. The deviation resulting from re-radiation varies with the incoming wave length, and does not readily admit of compensation, but is easily reduced to a negligible quantity by keeping the ship's service antennae on open circuit during compass observations. The re-radiation idea explains the necessity for an unidirectional vertical antenna located on the extended axis of the loop itself. In this position, its re-radiation does not affect the directional property of the exploring coil.

It has been the intention of this article to explain the "WHY" of the radio-compass, by drawing the reader's attention to the fact that the compass loop is actually the armature winding of an electric generator, whose magnetic flux is supplied by the incoming radio wave, and that by determining the position of minimum (or maximum) induced EMF the direction of the flux, and consequently of the incoming radio wave, has been determined. It seems unnecessary to burden the reader with the minute details of construction, installation, and use. These details are fully treated in the Bureau of Engineering's Radio-Compass Bulletins, No. 6, (The Construction of Apparatus Used in the U. S. Naval Radio-Compass, Ship and Shore Stations), and No. 5B, (Operation of U. S. Naval Radio-Compass Equipment on Shipboard).

In the present era of enlightenment, no mariner hesitates in the use of the standard compass, and many mariners now use radio-



bearings from shore stations as equally reliable. The radio-compass installation on board ship is inherently accurate, and its use is of absorbing interest. The desired precision in operation is but a question of practice, and, with practice the radio-compass will become of inestimable value for locating our own or enemy vessels at sea, for cruising in heavy weather, for guiding sea planes, for cutting down radio-interference by the transmission of *directional* undamped waves, and among other applications far too numerous to mention, as a certain vital element of the naval strategy of to-day.



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## A FUTURE USE OF RADIO-TELEGRAPHY

By CAPTAIN JOHN G. QUINBY, U. S. N. (Retired)

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A Résumé of its Progress—Its Application to Navigation, and Trans-Oceanic Flights—"Fixings" in Aerial Flights rendered "Practically Instantaneous"—THE SPHERICAL CHART-TABLE, Manufacture and Use explained, and what is and can be accomplished by its use.

The writer treats of this subject under progressive headings giving a brief résumé of the progress-of-the-art which has come under his personal knowledge. It can be readily understood that Radio or Wireless Telegraphy is in its infancy, practically born during the last generation, and that many people now alive saw its birth heralded and have witnessed or read of its progress in the daily press. It will be treated in a more or less chronological manner in order to approach methodically its main object.

This main object is to show how the radio-compass bearings received at shore stations in the ship-to-shore method can be applied without interpolations or logarithms to determine the location of a ship (surface or aerial), almost instantaneously—using the Spherical Chart Table. This method can easily be adopted—as is shown—to locate these ships, if bearings are obtained by the shore-to-ship method. Both these methods are treated of. The size and manufacture of this "Spherical Chart Table" is, of course, subject to be governed by external considerations—no standard size is yet determined.

As the paper progresses towards its conclusion, some corollary uses are suggested by the writer, and doubtless many others will occur to the bright minds who may or may not read this paper.

### ARRANGEMENTS OF HEADINGS

I. Radio or Wireless Telegraphy—Its History and Development.

2. The Radio-Compass, Its Development.
3. Radio-Compass Corrections, Ashore and Afloat.
4. Possibilities of Its Use for Surface Craft.
5. Its Use for Surface Craft.
6. Difficulties of Plotting Bearings Received.
7. The Two Methods of Obtaining Bearings Available.
8. An Easy Solution Proposed—the Spherical Chart Table.
9. The Method of Plotting Positions.
10. Concluding Résumé.

#### HISTORY OF RADIO, OR WIRELESS TELEGRAPHY

When the writer was in attendance at the Naval War College in 1896, the question of distant communication between ships was considered a knotty problem, and the Navy was doing its best to solve this problem. Outside of the use of Carrier Pigeons, the senses of sight and hearing only were under consideration, that is, visual or audible communication between ships in extended formation. Search light reflections on clouds were successfully tried at night and 30-mile communications sent and answered. A signal gun was estimated to be audible 10 miles—if conditions were favorable.

Marconi came along after the Spanish War, and in 1901-02 Naval vessels equipped with Slaby-Arco, Tellefunken or other sets were soon communicating up to 50 miles. But little was known of "interference."

As an illustration of this, during one of the International yacht races for the "America Cup" an attempt to report to their various papers, the progress of the race for bulletin information to the crowds on the street, resulted in such hopeless interference that absolutely all the money expended was thrown away. No intelligent information was received.

To those familiar with the laws regulating interference (the various methods of increasing the wave length; the "tuning up" or "tuning down" processes—now thoroughly understood—or the ability to distinguish the tone of the spark of the distant operator) such lack of knowledge would cause considerable amazement in order to properly estimate this interference.

The Navy, realizing the vast strategical advantage of radio communication, began experimenting and developing this new and untried means of communication.

About 1910, the U. S. S. *Birmingham* was heard a distance of approximately 4,000 miles and received messages practically the same distance. This shows the jump in radio-communication in less than 10 years. Governments then undertook to establish stations so that messages emanating from these stations could be heard around the world, and at present (by the use of great power and heavy expensive installations) such communication is doubtless possible or claims to that effect are made.

Changes in methods, increased knowledge and drastic regulations to prevent interference and regulate wave lengths have accomplished this vast improvement in 20 years, and radio telegraphy is still regarded as being in its infancy (1921).

#### THE RADIO-COMPASS—ITS DEVELOPMENT

Up to as late as 1910, it was generally believed that (as messages emanating from a given station progressed along the surface of concentric spheres whose center was the point of emanation and whose radii increased very rapidly—185,000 miles per second—being heard with equal volume anywhere on these surfaces) the direction from the point of emanation to point of reception was undefinable. About this time it was discovered it was possible to detect and define this direction. That is, the direction of the sending station from its point of reception. This lead naturally to a "direction finder," and this "direction finder" has had the name of "Radio-Compass" applied to it. Various claims as to the reliability of the "Radio-Compasses" have been made, but early experiments conducted by various Governments have, in great measure, thrown doubt upon these claims, "fixes" from such compasses were found (while even "close in") to be out 5 to 10 miles.

One of the principal causes for these errors was soon discovered, and with the "corrections" due to local causes applied, it was found that the earlier claims of accuracy were well substantiated, until now, the most optimistic of operators claim accuracy to "one-quarter of a degree."

N. B.—This "claim of accuracy" would seem excessive, as it may readily be conceived that while "radio waves" travelling over open water probably stick close to the original plane of transmission, if such a "radio wave" were to pass close to a ship or headland it would be deflected more

or less. As a matter of fact, "instructions to mariners" issued by Marconi caution them to use such bearings with great care and doubt.

#### RADIO-COMPASS CORRECTIONS ASHORE AND AFLOAT

The "corrections" alluded to in the previous paragraphs were of course due to

First. Faulty construction.

Second. Faulty installation.

Third. Faulty location.

Fourth. Faulty application of bearings.

In regard to these the first two can only be remedied as the "manufacture" and installations are improved, and these improvements can be hastened, or retarded, only as our knowledge increases, or is allowed to lag. The *third* is the easiest and the first to be overcome. It was found that a bearing coming in was deflected at the last moment by local attractions—doubtless due to "induction" in conductors at the point of reception—that is, the radio-compass station itself. This naturally lead to care in the selection of locations and to what is known as "station calibration," and these practically eliminated the greatest part of the errors of radio-bearings received at shore stations. The *fourth* source of error was doubtless due to the ignorance of many in assuming that visual rays are "rhumb-line bearings." In reality they are great circle bearings and only for short distances can they be plotted on Mercator's—the most used—charts as rhumb-line bearings with any degree of accuracy. Coasting vessels sighting lights are usually within 10 to 20 miles of the light, and the *error* in using the compass bearing of these lights and plotting on a coasting (Mercator chart) except in very high latitudes is hardly ever over 10' or 15' of arc. This is doubtless increased by the difficulty of obtaining accurate bearings and in using parallel rulers accurately. The universal use of "CROSS-BEARINGS" treated as "rhumb-lines" caused this error to be continued. A straight-line-of-sight (omitting "refraction" is of course admitted) but that "straight-line-of-sight" is always in a plane which passes through the "zenith" and the "nadir" of the observer, and is therefore a "great circle" which never plots on a Mercator's Chart as a straight line,—a small error is always creeping in, it is doubtless small for short distances, but is present.—It is to be

remembered that using the "radio-compass" has the effect of enormously increasing the distance of our mental visibility, and that this increase of distance increases the error of using these bearings as *rhumb-line bearings*.

There are doubtless other sources of error that further knowledge may help to eliminate, among these may be mentioned "EARTH-CURRENTS" due to the Sun's spots and electric disturbances, and probably many others. Radio-waves are probably very susceptible to "inductive influences" the attraction or repulsion due to parallel currents being pretty well understood among electricians deserving of the name. The distance through which these "inductive influences" may cause serious bending in the direction of the incoming waves must be considered, and stations above such influences must be built, and the surrounding conductive materials must be eliminated or removed; or the location so chosen as to render this cause negligible. Having previously chosen our location, this location is then calibrated.

#### *Calibrating a Station—Ashore*

The method used is easy to understand, and simple to perform and the other considerations being eliminated by choice of location when once properly performed needs only a periodical checking.

Briefly the method is described as follows:

At each station a destroyer or tug is sent out from a station radially until it is at the limit of visibility of its searchlight rays when *pointed straight up*. It then, by radio direction from the station, brings the station abeam and keeping it abeam steams on the arc of that circle. At stated times it stops sends in *5 sec dashes* for one minute, its radio-call-letters and "K" with its searchlight turned on; the radio-compass operator using these *5 sec dashes* reads his radio-compass bearings, and another observer takes an accurate visible bearing of the search-light ray. The difference of these two is the station calibration for that bearing. The destroyer then continues along the arc of this circle and at the appointed times stops and repeats.

A tabulation of these results is the correction to apply to all readings received at that station. It is practically a "deviation table" for that station, but is differentiated from a deviation table;

as of course, a station remains on a fixed heading and the calibration is the bending of the incoming radio-wave at its point of reception—in other words, the bending of the radio-wave due to local induction set up by the relative bearing of the incoming wave with respect to the inductive materials at that station. Hence it is given the name "*Calibration*" and not deviation.

This point is accentuated here because it has an important bearing on ship's radio-compass bearings. It is the correction for a *relative bearing* for one heading of the station.

### *Calibrations for Radio Bearings Afloat*

If a radio-compass be placed on a ship to determine the direction of a radio-wave sent out to that ship from a shore station, it has been found that these bearings are very much more unreliable than bearings received on shore. The most optimistic of these operators give or allow errors of 5 to 10 degrees. The difficulty here may be due entirely to changeable local conditions such as change in heat of smoke stacks, or to character of cargo. It is evident that in applying the calibration for any heading of the ship—that the relative bearing must first be estimated, and that during the reception of these bearing waves, the ship must maintain a perfectly steady course, and also the rolling and pitching of the ship would necessarily change "induction" attraction or repulsion in certain conductive materials which are necessary for ship's construction. Probably a mean of several such bearings might approach a correct bearing, but even this is doubtful, unless it were spread out over considerable time necessary to establish a reasonable *mean* and this, it must be remembered, means a change in the ship's position and mental gymnastics (introducing the human element) in applying these changes in relative bearings and the difficulty of keeping the ship on a steady course during this extended time interval.

The difficulties here enumerated seem to render the installation of radio-compasses on board ships for radio-bearings of doubtful value.

N. B.—This does not mean that a ship could not use such a radio-compass very effectively for other purposes. The writer has in mind a use of such a radio-compass for preventing collisions during fog.



## POSSIBILITIES OF ITS USE FOR SURFACE CRAFT

The Act of Congress passed July 23, 1912, makes unlawful for all ocean-going ships licensed to carry or carrying 50 or more persons, or for vessels plying on the Great Lakes, to leave or attempt to leave any port of the United States unless that vessel be equipped with a radio set capable of sending or receiving a message *day or night* over a distance of 100 miles.

It also requires an auxilliary power supply—independent of the ship's electric power plant—which can send and receive a message for *four hours day or night*, over the same distance.

It requires two operators for this radio installation and a continuous watch kept.

It is therefore evident that before a ship can get its inspection papers or clearance, it must be so equipped.

This being the case, every ship must be so equipped, and these radio sets must be able to reach shore, if it be within 100 miles.

Every deep-sea navigator knows that if he can locate himself accurately when he reaches a point 100 miles from his destination, he can shape his course for his destination with reasonable certainty. The Navy Department on every Pilot Chart publishes a list of stations located all along the coast and *invites* mariners to make use of these to locate themselves—*free of charge*.

THIS LIBERALITY is in marked contrast with the custom and requirements on the coast of England (a coast notorious for its fogs, and periods of low visibility) where 5 shillings is charged for each and every bearing.

The use of these radio-bearings by surface craft renders "land-falls" certain. It has been successfully used by the writer on more than one occasion on either side of the ocean for even greater distances than 100 miles and delays and dangers escaped by its use.

In using these radio-bearings for the distances mentioned a correction was always applied, which the writer came across in the *British Nautical Magazine* by Sinbad, which will in this article be called "Sinbad's Formula." It is given herein:

$$\text{Correction (in minutes)} = \frac{\text{Difference in longitude (in minutes)}}{2} \times \text{sine "L"}$$

This formula gives the correction to apply to the radio-compass bearing received from the Shore station whose "L" (latitude) is known if the ship's position by D. R. is known,—it must be correctly applied:—*additive* to radio-compass bearing received if ship's position be to the *eastward* of radio-station; and *subtractive* if ship's position be to the *westward* of the shore station, in *northern latitudes*, our compasses being marked  $0^{\circ}$ - $360^{\circ}$ .

N. B.—Attention is again invited to the fact that by using this formula, that we are using the radio-compass bearing as a visual direction and intend to plot on a Mercator's Chart, it is sufficiently accurate for distances up to 300 miles. It being, of course, impossible to see 300 miles, the effect of the radio-compass being simply to extend our vision so that we know the direction of the "radio-compass station" 300 miles away.

It is further noted that on the back of the North Atlantic Pilot Chart for February, 1921, Mr. Collins—nautical expert for the U. S. Hydrographic Office—has given another method for correcting these radio-compass bearings, much easier to understand, but not so easy to apply—it being in fact a "trial and error" method which for the distance named (300 miles) gives the same results as Sinbad's Formula.

#### USE OF THE METHOD FOR SURFACE CRAFT

This method is strongly recommended for the use of "surface craft," as by its use port can always be made in thick and foggy weather. It is not considered necessary to remind mariners of the danger of collision during foggy weather, but it is done nevertheless.

N. B.—A suggestion for preventing collision during foggy weather is introduced by the writer.—If in addition to the requirement of radio equipment (Act of July 23, 1912) a small radio compass set were required to be carried and a weak call audible only two miles was required to be sent on entering and during continuance in a fog, the greatest and most dreaded danger would be practically eliminated, for if a ship's bearing be fairly established it at once becomes easy to avoid collision with that ship.

This, in conjunction with ability to shape course for port during fog, leaves little danger to be apprehended by mariners.

## DIFFICULTY OF PLOTTING RADIO BEARINGS

This difficulty has been largely overcome by either applying "Sinbad's Formula" or, using Mr. Collin's method. Sinbad's method is not accurate beyond 300 miles, and the method proposed by Mr. Collins, is correct in theory, but is a "trial and error" method which should require a second application if distances are great. This latter method requiring interpolations and calculations requires time—not always at the disposal of air craft navigators.

N.B.—Radio bearings of  $0^\circ$  or  $180^\circ$  are *always* correct, and on Equator bearings of  $90^\circ$  or  $270^\circ$  are correct, and these radio bearings can be used on any chart (Sinbad's formula reducing to zero in each case).

When time is available, the method of finding the crossings of the meridians on either side of the ship's D. R. position from each radio-compass station, is the surest way, but while it can be applied by surface ships having the time, it is out of the question to use this method on rapidly moving "air craft" subject to strong air currents, something quicker is necessary here. Attention is invited to what has already been said regarding radio-compass bearings as great circle bearings.

## THE TWO METHODS AVAILABLE

These are:

First. "Ship-to-shore" method.

Second. "Shore-to-ship" method.

These will now be briefly discussed under separate headings.

*"Ship-to-shore" Method*

In using this method, a ship at sea sends in a "Q. T. E." International query—meaning, what is my bearing? By the instruction on every Pilot Chart she does this, using an 800 meter wave length, a shore station hearing this "Q. T. E." answers "K"—go ahead. To identify herself, the ship then sends in her radio-call-letters for 30 seconds, and then makes *dashes* of 5 *sec.* for *one minute*. If during this *one minute* the radio station has determined correctly the ship's radio bearing she sends out "K", and then *spells out* the radio bearing in degrees. The ship answers this by sending back the bearing in degrees *using numerals*.

Along our coast "entrances of importance" have three radio-stations in telephonic communication with each other. These stations give a base-line long enough so that a ship within 100 miles can be accurately located, but all three bearings are sent the ship and she does her own plotting.

N. B.—Each station being calibrated applies its own calibration corrections and sends to central station or ship its calibrated radio bearing.

It is perfectly possible in this manner to locate a ship accurately enough for the ship to find port by not using Sinbad's Formula—if Sinbad's Formula be used, a ship is more accurately located, and better allowances for tides and currents can be used.

Not using Sinbad's Formula, does not necessarily lead the ship into danger; as by keeping in communication with the radio-compass station, the bearings given as you near port become more and more accurate, as by Sinbad's Formula the correction reduces to zero when the difference in longitude becomes zero.

For distances which the law requires the radio installation to be able to send, there now exists no reason for not being able to shape the course to port in the heaviest fog. As the distance increases more power must be used to reach the shore station to enable that shore station to get your radio-bearings. As stated under "History of Radio or Wireless Telegraphy" by using sufficient power a radio-compass station could obtain bearings for any distance off shore, and it follows from this that radio-compass navigation is destined to be used as the art of "radio-telegraphy" progresses, replacing the present astronomical navigation for any distances, and it follows, too, that if this radio-compass navigation can replace astronomical navigation, owing to the rapidity of plotting it will be used principally for plotting positions of "air craft" when trans-oceanic routes are established.

The main difficulty to be encountered is the difficulty an air-ship would have in carrying the weight of a sufficiently powerful sending apparatus to reach half way across the route to be used. If this handicap be overcome its possibility must be admitted.

#### *"Shore-to-ship" Method*

In a sense this is the reverse of the other operation. The shore station (which can easily overcome the handicap of weight for

sufficient power) sends out at stated intervals its radio-call-letters for 30 seconds, followed by 5 *second dashes* for one minute. This powerful call is easily read by a very light radio-compass on ship, and on a receipt of a second bearing from another powerful shore station (so located as to give a good cross) the ship plots her own position.

The method of plotting these bearings will be given.

From what has been said about radio-compasses afloat, it will be at once realized that until the progress-of-the-art improves the reliability of the ship radio-compass sets; that, while the handicap upon the surface ship carrying necessary weight and costly equipment may be overcome, the *handicap* of unreliability using "shore-to-ship" method renders its use inadvisable.

Both methods are discussed, and each has its advantage over the other. In the improvement and the "progress-of-the-art" some inventors will work along one line, and some along the other and doubtless the future may find such progress has been made that either method can be used.

In which event it becomes necessary to consider the use of both methods which is done under the headings following.

## AN EASY SOLUTION PROPOSED

### *Conditions*

#### *Considerations Governing Selection of Routes*

A study of probable routes for successfully navigating an aerial craft trans-oceanicwise, shows that to cross the Atlantic with a chance of favorable air-currents covering the shortest open water space, a route must be selected starting from the vicinity of St. Johns, N. F., to Valentia, the S. W. corner of Ireland. Using this route an air-ship generally finds westerly air currents and its apex is reached in  $52^{\circ}-21'$  N. Latitude; it passes within 750 miles of the southern point of Greenland, which is within 900 miles of St. Johns, N. F.; it passes within 700 miles of the southern point of Iceland. It is never over 1,100 miles from Horta or Corvo Island, and it passes within 750 miles of Corvo Island.

It is only 1,639 miles by closely following a great circle route from St. Johns to Valentia.

In consequence of these figures, it is evident that 850 miles is the longest distance necessary to send in wireless calls to reach some two of the five stations enumerated (which are considered necessary for the use of radio-compass navigation in crossing the Atlantic Ocean).

Certainly an apparatus capable of sending 1,200 miles would cover all the necessities for the employment of radio-compass navigation in crossing the Atlantic. It is not claimed that such an apparatus in the present "progress-of-the-art" can be carried by an aeroplane, but it is a significant fact that the ill-fated ZR-2 was reported to have a radio set capable of sending 1,200 miles. A little further study of this route reveals the fact that the limits of longitude are covered by  $43^{\circ}$  approximately. The limits of latitude  $30^{\circ}$  approximately.

In crossing the Pacific Ocean from Yokohama to Vancouver, the Aleutian Islands offering landing places and radio-compass stations and the limits of latitude from start to finish are within the limits of the trans-Atlantic route selected; and using these stops the limits of longitude are also the same.

It is thus seen that a portion of a sphere of such radius to cover  $43^{\circ}$  of longitude in the latitudes  $35^{\circ}$  to  $65^{\circ}$ —N, which roughly is (for longitude)  $1/9$  of this sphere, and (for latitude)  $1/12$  of this sphere, would give all the working surface for the navigation of both of these trans-oceanic routes.

To cross North America, Europe and Siberia, no navigation across waters is needed; therefore it is seen that with radio-compass navigation, it is possible (or soon will be) to encircle the world between latitudes  $30^{\circ}$  and  $60^{\circ}$  N.

Assuming a unit of  $1/8$  of an inch to 6 sea miles on the Earth's surface we obtain 1.25 inches for a degree of longitude on the Equator. A simple calculation shows that a sphere of 12 feet diameter would give 1.258 inches to a degree, therefore, a 12 foot sphere will be considered.

On such a sphere the chord of  $43^{\circ}$  of longitude in latitude  $35^{\circ}$  is *42.79 inches*; at  $65^{\circ}$  latitude the chord is *22.64 inches*. A chord for  $30^{\circ}$  of latitude on this sphere is *37.27 inches*.

Hence if we construct a table with four legs and a flat top 44 inches long, by 40 inches wide, such a table would carry the portion of this sphere of 12 feet diameter, that it is desired to use.

On the surface of such a portion of the sphere, as we are considering; viz:  $43^\circ$  of longitude and taking in from  $35^\circ$  to  $65^\circ$  of latitude, it is evident that the middle meridian is  $21^\circ 30'$ , and the middle latitude is  $50^\circ$ . This latitude and longitude marking the middle point of this portion is the crown of this surface of double curvature. It is the sum of the versines of the arcs of  $43^\circ$  and  $30^\circ$ , which on this 12 foot sphere, is 5.67 inches. This point is therefore 5.67 inches above the surface of the table.

A box-like cover of the following dimensions:  $44 \times 38.5 \times 7$  inches could be lined with felt and cover, and protect this surface, and is the space in which it could be stowed.

### *The Spherical Chart Board Described*

This spherical surface can be made of any material which will not warp, and it should be marked for every degree of longitude and latitude within the limits mentioned.

The established radio-compass stations having been accurately marked by *latitude* and *longitude*, and a small pin securely fixed marking each radio-compass station, so established, around each such station a circle having a 10 degree chord of the 12 ft. sphere as a radius is drawn, or such portion of that circle as the limits of the portion of the sphere in use permits of. The meridian passing through each station will give the "zero" or the "180 degree compass" bearing. Every degree on this circle from the "zero" or "180 degree" initial points is marked. A silk cord is attached to the pin marking each radio station. The chart table is now ready for use.

### *The Method of Plotting, Using "Ship-to-Shore" Method*

To describe the method of using this spherical chart-table the navigation of a flight will now be described by an aero-plane leaving St. Johns, N. F., bound for Valentia.

At stated intervals the aero-plane sends out calls which are received at St. Johns and Cape Farewell, Greenland, until some two other radio-stations become better situated. From St. Johns, N. F., a radio bearing of the plane is received as "a" degrees, then from Cape Farewell the bearing is received of "b" degrees. The plotter now taking the silk cord, from St. Johns radio-station in his

right hand moves it across the face of the sphere (keeping a good strain on it) until the cord passes through the point marking "a" degrees on the "compass rose" surrounding St. Johns, N. F. Taking the silk cord from Cape Farewell in his left hand, he moves that hand over the surface of the sphere (keeping a strain on the line) until it passes through the point marking "b" degrees on the "compass rose" circle around Cape Farewell. Where these two cords cross each other is the location of the aero-plane (correct within the limits of the radio-compass bearings, and the reading of the observer). Repeating this progress at stated intervals the aero-plane is located all the way across to Valentia. This is by the use of the "ship-to-shore" method.

#### *The Method of Plotting, Using "Shore-to-Ship" Method*

To use the "shore to ship" method it will be necessary to have a spherical protractor made to fit the surface of the 12 feet sphere.

On the reception of bearings by the radio-compass on the aero-plane the spherical protractor is set to these angles. One arm is made to pass through one station keeping the "zero" or "180 degree" point on the meridian, moving along approximate route, until the other arm passes through the second station, when the *centre of the protractor* will mark the ship's position.

#### THE QUICKNESS AND SIMPLICITY OF THESE METHODS

No plane of paper can be made on any projection that accurately describes a development of the Earth's surface without distortion, therefore it is necessary to use a spherical surface with a fixed ratio with that of the Earth. It is seen that in the methods described at length in the preceding paragraphs, no parallel ruler or logarithmic table or interpolations are used. The radio-bearings only are used without correction and the location of the ship is at once obtained. This method is mathematically correct, no errors entering into it except inherent errors through the inaccuracies of the radio-compasses and operator.

#### CONCLUDING RÉSUMÉ

It is seen that, by the use of "radio-compass bearings" for navigational purposes, we have dispensed with the necessity of using celestial bodies.



When the "Progress-of-the-art" reaches the point that these radio-compass bearings can be relied upon up to 850 or 900 miles (BEING INDEPENDENT OF FOGS AND CLOUDS), we are simply extending our human vision by just the extent we can rely upon the bearings as to distance.

If in addition to this extension on the human vision, we find that we can rely upon the radio-compass—as to accuracy—trans-oceanic navigation is reduced to the use of "CROSS-BEARINGS" to navigate any kind of a craft anywhere on the surface of the ocean, provided suitable radio-compass stations be established. Moreover, this navigation can be made practical, mechanical, and instantaneous.

Using the silk cord from the found position of the vessel, to the destination gives at once the course and distance.



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## PRINCIPLES OF COMMAND

By REAR ADMIRAL LLOYD H. CHANDLER, U. S. Navy

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KNOWLEDGE OF THE PRINCIPLES UNDERLYING THE CREATION AND  
MAINTENANCE OF HIGH MORALE, LOYALTY, AND  
MILITARY CHARACTER AS A FACTOR IN MORALE

### MORALE

What is *morale*? The dictionaries give us:

*Morale*—Conditions as affected by, or dependent upon, such moral or mental factors as zeal, spirit, hope, confidence, etc.; mental state, as of a body of men, an army, and the like. (Webster's *New International Dictionary*.)

*Morale*—State of mind with reference to confidence, courage, zeal, and the like, especially of a number of persons associated in some enterprise, as troops. (Funk and Wagnall's *New Standard Dictionary*.)

These definitions are satisfactory as far as they go, but in dealing with so intangible an asset as morale some further elucidation of the term is required, and for this purpose the writer can present no better explanation of the full meaning of the word morale, as applied to a military force, than that given in a recent book by William E. Hocking, entitled *Morale and Its Enemies*, which explanation reads as follows:

Perhaps the simplest way of explaining the meaning of morale is to say that what "condition" is to the athlete's body, morale is to the mind. Morale is a condition; good morale is a good condition of the inner man; it is the state of will in which you can get most from the machinery, deliver blows with the greatest effect, take blows with the least depression, and hold out for the longest time. It is both fighting-power and staying-power and strength to resist mental infections which fear, discouragement, and fatigue bring with them, such as eagerness for any kind of peace if only it gives momentary relief, or the irritability that sees large the defects in one's own side until they seem more important than the need of defeating the enemy. And it is the perpetual ability to come back.

From this it follows that good morale is not the same as good spirits or enthusiasm. It is anything but the cheerful optimism of early morning, or the tendency to be jubilant at every victory. It has nothing in common with the emotionalism dwelt on by psychologists of the "crowd." It is hardly to be discovered in the early stages of war. Its most searching test is found in the question, How does war weariness affect you?

Fitness and readiness to act, the positive element in morale, is a matter not of good or bad alone, but of degree. Persistence, courage, initiative, may vary from zero upward without limit. Perhaps the most important dividing line—one that has already shown itself at various critical points—is that between the willingness to defend and the willingness to attack, between the defensive and the aggressive mentality.

But the readiness to wait, the negative element in morale, is as important as the readiness to act, and oftentimes it is harder virtue. Patience, especially under conditions of ignorance of what may be brewing, is a torment for active and critical minds such as this people is made of. Yet impetuosity, exceeding of orders, unwillingness to retreat when the general situation demands it, are signs not of good morale but the reverse.

However far the orders go, there is always the last touch that cannot be commanded, but can only be given. All the difference between effective and ineffective war-making lies in the success of government or command in enlisting this free contribution of the man to his defined duty.

We may then consider that, when we speak of a certain military organization as possessing *high morale*, we mean that its members, individually and collectively, have had induced in them a certain condition of mind that is highly necessary if they are to carry on military operations successfully; that they have been so trained that they are ready to give that "last touch that cannot be commanded, but can only be given"; that the superior command has from them succeeded in "enlisting this free contribution of the man to his defined duty." To induce this condition the commander must proceed in accordance with psychological principles; that is, high morale, being a desirable mental condition, is an end to be accomplished, and psychology teaches us the means by which to attain this end. Such being the case, every discussion of morale must in general be psychological in its nature.

Ship life is a life in itself, apart from anything else known in life, and as such it makes its imprint upon all minds that undergo it. Therefore, in considering the minds of naval personnel, we must remember that such minds have inevitably been influenced by environment, by the peculiarities not only of military, but of ship

life. To appeal to such minds as though they were what would be called normal in civil life would be an error—such minds are not normal according to civilian standards. It is in this particular that civilian officials most frequently err in their control of and dealings with naval personnel; and their failures are not only in an inability to properly fathom the workings of the naval mind, but generally in a complete failure to comprehend that such minds are vastly different from their own; or, worse yet, if they recognize that such differences exist, in a determination to disregard the peculiarities of the naval mind and to force it to conform to civilian standards—to their own. Such an effort as this last is bound to be disastrously unsuccessful. Hocking says that “a man’s mental self cannot be separated from his daily habits, from the environment he lives in, from the kind of difficulties he is coping with, from the plans, ambitions, and ideas that he is occupied with.” Whosoever attempts to run counter to this idea in dealing with naval personnel not only causes loss of morale, but attempts to change such a state of mind from that which is desirable to that which is undesirable—to disintegrate a desirable condition, one that has been built up by much study, effort, and time, into one that is entirely unsatisfactory for naval purposes.

In further considering the life of a man in the navy, there must always be borne in mind the loss of personal freedom inevitably incident to such life, a realization of which loss must always remain in some degree to affect a man’s mentality, no matter to what degree years of contented and happy service may tend to diminish any sense of real loss from this cause. Therefore, as a step in creating morale, the effort must be to obliterate as far as possible this sense of loss, and to supply other desirable things that shall in a great measure compensate for it. That is, interest in the life and contentment must be supplied. Interest is generally aroused by ambition—personal ambition and ambition to achieve in the name of the service and of the country. Contentment follows just treatment, interesting life, comfortable life, work in quantity and character proper to cause the days to pass without *ennui*, and absence of disagreeable or excessive labor and of abnormal and uncomfortable living conditions. Under war conditions the elements of contentment, as enumerated above, in a large measure cannot be

supplied; and, under such circumstances, we must appeal to interest and ambition to make good the loss in other directions.

In the effort to build up morale in a body of men there is one very critical point in their development which should be regarded with the utmost attention—its place and character are epitomized in the old saying that “a little learning is a dangerous thing.” In the discussion of *child psychology* attention was called to the fact that in the induction of recruits into naval life we have a problem somewhat similar to the education of a child; and it may with reason be said that the problem is also similar in character to the one that exists in the absorption in mass into our body politic of a group of ignorant immigrants. An entirely ignorant body of men may be ruled through fear, by playing upon their superstitions, or by the influence exerted over them by a commanding personality; but these means of control continue effective only so long as the individuals composing the group remain uneducated. Now it is against our national policy (if not our national practice) that any of our citizens or permanent residents shall remain uneducated, and so the education of a body of immigrants is supposed to begin as soon after they are admitted to the country as we can start it. The result of this first educational effort is that fear, superstition, and personal influence soon cease to give the power of control; each individual in the mass begins to crudely understand the things that go on around him—or to think that he understands them—and to think for himself; and, unfortunately, of himself exclusively. It is at this stage of development; so often seen in the history of immigration and of the negro race, and today very strongly in evidence in both cases; that danger to the commonwealth ensues. The power of control through fear, superstition, and pure personal influence has passed away, and instead we have what the individual concerned considers to be knowledge and thought, but what is in reality only false knowledge and wrong thought processes. It is upon this condition that the demagogue plays—personal influence of a kind, to be sure, but influence not based solely on the personality of the demagogue, but mainly upon the real ignorance but supposed knowledge of the victim. Through this relationship is made the appeal to faulty reasoning powers; through it the original fear of the ignorant is changed to

the anger and resentment of the half-informed; and then, in labor circles, we have the unreasonable strike to gain impossible ends, and with it violence. Through this stage of educational development man thinks of himself alone, and the danger from him continues until further education and broadening of the mind make him see that his own well-being is dependent upon that of the surrounding community. In this awakening there may or may not be an altruistic element—let us consider that there is not—but in any event, as soon as a man awakes to the fact that by helping the community in which he lives he helps himself, then the period of gravest danger is over so far as that individual is concerned. Whether his motives be selfish, altruistic, or both, his realization that he must support the organized society of which he is a member will make him consider well before he rebels against law or custom. In general, and this country is now suffering from this cause, this awakening first takes form in loyalty to some narrow element in the community—usually to his own particular labor union—wherein lies trouble if the leaders of that union be not alert, honest, and conservative. When the man sees that his first responsibility is not to himself; is not to any one class of society, as to a labor union; but to the community at large; he then becomes, according to his mental capacity, a real, reasoning being, capable of a sufficiently broad view of life to make him realize that present self-control and restraint, even though inspired by purely selfish motives, bring future benefits that are well worthy of present effort and sacrifice.

A somewhat similar phase is passed through by the naval recruit; when he enters the service he is controlled by a feeling that perhaps cannot properly be called fear, but better, a natural awe of his strange surroundings; which feeling makes him attempt to fall into step with what goes on around him. Instead of superstition we have in him a feeling that urges him to accept conditions, rules, and regulations as they are without seeking to question them; and the personal influence factor becomes not only that actually exerted by the individuals who directly control him, but an influence emanating not alone from an individual, officer or man, senior to him, but as well from its outward and visible sign of power and designating symbol—the uniform. As the recruit be-

comes somewhat accustomed to his life, after his naval education is well under way, there comes a time when he naturally begins to question everything. His feeling of awe and his lack of ease due to strange surroundings have departed and no longer exert a controlling influence upon him. He begins to look upon the rules, regulations, and customs of the service as being arbitrary and useless, for he is taking the narrow, half-educated view, and sees not the broad purpose for which such things exist. Regarding things in this light, he looks upon those who exercise personal control over him simply as representatives of a foolish and oppressive rule, and he sighs for the lost freedom of civil life. It is in this stage of development that the recruit becomes a source of danger, a prey to fomenters of indiscipline; in the old days a man ready to join in a mutiny, and today a man who does and must lower the morale of the unit to which he belongs. He must be carried through this stage safely and quickly, or else removed from the service; and fortunate is the organization which, by its educational methods, by its ruling personalities, and by its general morale makes this period short for the recruit and quickly teaches him to see that that against which he is now inclined to rebel is a necessary attribute to an efficient and contented military unit. That such is the case is shown by the fact that, if justness prevail on board, the taut ship is the happy ship and the efficient ship. There each man, having learned to look beyond his own immediate selfish impulse, has found out that in the happiness and efficiency of his community alone are to be found happiness and progress and development for himself. The conditions most favorable for passing a recruit quickly through this dangerous stage in his development depend upon two factors; first, upon his being a member of a contented, well-disciplined, and efficient organization; and, second, upon there being a small percentage of such recruits in the unit at the same time. Under these conditions the recruit, unless hopelessly bad, passes through the danger zone quickly and unconsciously, but when other conditions exist the morale of the whole is necessarily lowered by the presence of a large percentage of disgruntled, rebellious and half-trained men. Unfortunately when war breaks out we see a great mass of recruits coming into every organization, enough to swamp it under ordinary conditions and



certainly enough to materially lower its morale under any conditions; but fortunately, on the other hand, at such times we have present in practically every recruit ambition and desire to serve, and the presence of these feelings, together with the generally higher character of men brought in by the outbreak of war, enables us to work wonders even with such a mass of raw material.

To create high morale a commander must inspire those under him with a feeling of confidence in himself, in his knowledge, ability, strength of character, justness; in fact with a confidence that he possesses all the qualities that are discussed in this thesis as being requisite for command. For instance there is nothing that so helps the captain of a ship to inspire the officers and men under his command with a belief in him, nothing that so aids him to improve their morale, as the ability to handle the ship boldly and well, and the willingness to do it when occasion demands. And not only is the manner in which the ship herself is handled of importance, but as well the personal manner and bearing of the officer who does it. A well-handled ship, showing this most noticeable outward symptom of efficiency, inspires her personnel with an ambition to equal her efficiency in that particular in all others as well; it gives every officer and man a feeling of pride in her and a desire himself so to do his part that she may be as efficient in all functions in which he personally takes a part as she is in those directly controlled by the captain in person. While endeavoring to inspire the above feeling in regard to himself, a successful commander must at the same time inspire in his subordinates self-respect, confidence in themselves, ambition, a conscientious regard for duty, etc.

From this discussion it is apparent that in the mental condition that is indicated by the phrase *high morale*, there must be a certain *hard* quality. There can be no high morale in a soft organization, and it is reported of one of the Prussian generals of the earlier days that he always toughened a new regiment by firing into it with artillery and infantry—a truly Prussian proceeding, if the story be true. This exaggeration indicates a danger, however, and that danger is that in our efforts to attain comfort, contentment, and amusement for our personnel, we may ren-

der them soft by "coddling" them unduly—I believe that the Navy is today suffering from this fault to a very considerable degree. Many times within the last few years I have heard officers—not a few of them old enough to know better and to be ashamed of themselves—bemoaning the hardship and bemoaning the effect upon morale of things that a few years before were matters of course. I have heard that being in Mexican waters for six months without liberty was a great hardship that it was a crime to impose upon men, and that the morale of the ship's company was low at the end as a result! I have heard that having to go without fresh meat, fresh potatoes, or what not of that kind, for a week, was an unendurable hardship! I have heard that the running out of the canteen stock and delay in receiving a new supply was a hardship! I have heard that not receiving a new supply of "movie" films from time to time was a hardship and exercised a deleterious effect upon morale! I have heard that being deprived of athletic opportunities by the exigencies of the service was a hardship and deleterious to morale! I might proceed with this list considerably further, and I cannot but wonder if these officers and men do not in some degree lack that hardness that is a necessary element in high morale. To a man who has seen the days when there was no canteen, when fresh provisions were available for officers and men in port only and even then were given to the men every other day at the most, when there were no amusements or athletics, when the personnel of a ship thought they were fortunate if their tour of "no liberty" duty in the West Indies or elsewhere was less than a year in length, when nothing but warm water came from the scuttle butt, when there were no ice machines, and when absence from home on foreign station (and families could not follow greatly in those days of long distances and difficult travel) for from three to four years was a common thing; a part of the day's work, so to speak; and not as now the exception; the question cannot but arise in my mind as to whether today we are not suffering from *softness* to a degree not a little detrimental to our morale.

Far be it from me to advocate a return to the old conditions in full—I believe in every possible effort to ameliorate the undoubtedly hard life of the naval personnel, and I know that when

great demands come, as they did in the last war, officers and men alike respond with alacrity and bear with equanimity and fortitude the conditions to which they are necessarily exposed. But is the spirit that does this so good, the morale so high, in a force that does this and pats itself on the back for so doing, as it was in a force that not only stood ready to do the same things in the same emergency, but that actually did many of them or worse, daily, in the routine performance of duty and without considering it anything outside the line of regular duty? Then there was little talk of a lowering of morale from these causes. This question is well worthy of serious consideration, and of such effort to change the feeling of today into that of yesterday as may be found practicable without the infliction of undue hardship.

To go into details in regard to all the methods of creating and maintaining morale; as to how best to attain the desired results; would reach far beyond all possible limits of a general thesis.

#### ESPRIT DE CORPS

*Esprit de corps* is a phrase formerly extensively used in speaking of the military and naval services or of individual units thereof, but of late years it appears to have become merged in the more comprehensive term *morale*. The dictionary definitions of the phrase are:

*Esprit de Corps*.—The common spirit pervading the members of a body or association of persons. It implies sympathy, enthusiasm, devotion, and jealous regard for the honor of the body as a whole. (Webster's *New International Dictionary*.)

*Esprit de Corps*.—A spirit of common devotedness, sympathy, or support among members of an association or body; comradeship. (Funk and Wagnall's *New Standard Dictionary*.)

From these definitions it will be seen that the now more widely used word *morale* includes all that could be included under the narrower phrase *esprit de corps*, for morale refers inherently to the entire body military under consideration, whereas *esprit de corps* may refer to the spirit within a part of such complete organization, literally, within any one particular *corps*. In one corps of the navy there may be high *esprit de corps*, and yet that feeling may tend to do anything but improve the service *morale*, as was the case in the days of the old line and engineer corps bad

feeling, which operated to lower service morale. Therefore we may say that *esprit de corps*, as the phrase was formerly employed, implies in a lesser and incomplete sense what we have more lately come to designate as *morale*.

#### LOYALTY

Loyalty is certainly a very great element in morale. The dictionaries give us as definitions of loyalty and of the necessarily accompanying word *loyal*, the following:

*Loyalty*.—State or quality of being loyal; fidelity to a superior, or to duty, love, etc.

*Loyal*.—Faithful to law; faithful and true to the lawful government, or to prince or sovereign to whom one is subject; unswerving in allegiance. (Webster's *New International Dictionary*.)

*Loyalty*.—The quality or state of being loyal; devoted allegiance to a government or chief; hearty service in friendship or love, or to a cause.

*Loyal*.—Constant and faithful in any relation implying trust or confidence, as wife to husband, friend to friend, etc.; bearing true allegiance to constituted authority; specifically, adhering to the constituted government in time of rebellion or revolution. (Funk and Wagnall's *New Standard Dictionary*.)

From these definitions we may with justice infer that we must seek to inspire in the personnel of the naval service loyalty to:

1. *Country*, which is patriotism.
2. *Duty*, in general, and in every case loyalty to one's mission. Such loyalty implies the possession of a high sense of duty.
3. *The Service*, which is *esprit de corps* in its broadest sense, the corps in question being the Navy as a whole and not any one of its component parts.
4. *Seniors in Command*, for unless such seniors command loyalty both to themselves and to their plans, whole-hearted and successful efforts cannot be expected from subordinates.
5. *Subordinates*, for unless an officer is loyal to his subordinates he cannot expect them to be loyal to him; a fact too often forgotten in the old days, when many officers of rank conceived that it must be sufficient honor and glory to serve on board *my* ship, no matter what might be *my* capabilities or character, nor what kind of treatment *my officers* and *my men* might receive from me. To secure loyalty from subordinates one must furnish something to which they can be loyal. It has been to the credit of the service

through many years that where the immediate superior has so failed to secure loyalty to his own person, the greater sense of loyalty to country, to service, and to duty on the part of officers and men has carried the Navy through.

6. *Self*, for if a man be not loyal to the best that is in him it is inherently impossible for him to be loyal to anyone or anything else.

We see from the above that in general we have to consider two forms of loyalty, the one, which is the greatest, being loyalty to a cause, to an idea, to a principle, and the other being loyalty to an individual. Of course apparent loyalty in either case may be inspired by selfish motives, but such loyalty is only superficial and is not real—it is not loyalty at all, but merely service rendered for pay received, promised, or hoped for, and need therefore receive little attention as a true element of loyalty. True loyalty to cause, idea, or principle is a matter of conscience and honor, and as such is the highest form. In history we see repeated cases of loyalty to prince or sovereign, inspired (neglecting the selfish considerations touched upon above) by affection for the person himself or for his personal cause. In some cases such loyalty to an individual has been coincident with loyalty to higher things—that depends upon the justice of the cause of such individual—whereas in others it has been directly opposed to all true loyalty to higher things. Such cases, when of important dimensions, have usually occurred in countries under the direct personal rule of an individual sovereign, and such loyalty is usually absent, except among a few personal adherents, in such a democracy as ours. No matter how much we of the naval service may admire the individual who may happen to be our president at any moment, it has never been and probably never will be possible for any holder of that high office to inspire in the service at large such a sense of personal loyalty to himself as an individual as would cause the service to hesitate for an instant between loyalty to the president as an individual and loyalty to the country and to the principles underlying our form of government. One reason for this is the fact that no naval officer has ever attained the position of president, and should one do so he will thereby vacate his position as a naval officer. Only an officer of years and rank could ever do this, and should it ever

happen it is probable that the service at large would look upon the individual concerned with lessened, rather than with increased respect and loyalty to him as an individual. As a result of all this the individuals composing the service have little personal knowledge of him who for the time being occupies the office of president, and the short tenure of office of the president and his many other pressing duties and demands upon his time prevent him, even should he so desire and even though he be the titular commander-in-chief of the Army and Navy, from gaining such intimate acquaintanceship with the officers of the service and from building up among them such personal influence as would substitute loyalty to his person for abstract loyalty to the country and to him impersonally in his capacity of chief representative of the people whom all serve alike.

Passing down the line from the President to his immediate subordinates, we find much the same conditions existing in regard to the Secretary of the Navy, for his personal acquaintanceship with and influence over the officers and men of the service must necessarily be slight. When we come to the senior naval officers, however, the situation is different. Here we have men who have a large acquaintanceship in the service; we know them personally and have formed our own estimates of their strength and weaknesses. Here there is an opportunity for such an officer to build up a personal following, and many such officers have had such a following, but to their credit it may truthfully be said that there is no case on record where any naval officer has knowingly or purposely employed such influences along lines detrimental to the interests of the country or of the service. Not only has this been true, but it is an undoubted fact that any such effort, had it been made, must inevitably have resulted in failure—the sense of loyalty to country has always been so strong in the rank and file of the service that any such effort would have promptly disintegrated all personal influence of the individual making it—the navy of the United States has never taken part in any *coup d'état*.

But loyalty to the individual on the part of the service, when properly used by its possessor, is a most important asset, not only to an officer in command who possesses it, but to the service and to the country. There is no greater upbuilder of morale in any

organization than a feeling of loyalty to its head, and, if this head use this sentiment patriotically and wisely, it becomes a distinct and very great asset to the service and to the country, and inspires the organization with a spirit and *élan* that can be aroused by no other feeling. Therefore, personal loyalty to a commander is an all important element, the attainment of which should be the effort of every officer; and, having gained it, he should use it for the betterment of his own immediate command and for the service of his country. No better example of great personal influence over subordinates gained by an officer and usefully employed by him in the service of his country can be found than is shown in every phase of the life of Lord Nelson.

#### MILITARY CHARACTER AS A FACTOR IN MORALE

Military character is later more fully discussed under the general heading of *character*, but it is here pertinent to speak of it without detailed analysis and merely as an element of morale. Morale cannot be created unless there be something upon which to build, something to which appeal can be successfully made. Character, both military and personal, furnishes such a foundation—if the character of the individual be high then the appeal can be successfully made; if it be low, little or no success will be attained. And it may justly be said that, from this particular angle, stability of character is a prime essential. No morale can be established upon a low character, but there are also many men not of low character who, although the appeal for high morale can be successfully made to them at first, lack the necessary hardness and stability, the requisite fortitude and other similar characteristics, to enable them to maintain the state of high morale towards which their environment, the influences exerted upon them, and, it may be, their own inclinations, tend to lead them and to which they may in truth personally aspire. The mercurial temperament, no matter how worthy may be the character that accompanies it, while it may be capable of being elevated for the moment to a state of exceedingly high morale, is nevertheless a very poor field to cultivate for the *maintenance* of that most necessary quality, for if the cultivation be remitted even for a moment, or if circumstances bring about temporary discouragement, the tares spring up and choke the wheat.

We are here discussing the creation and maintenance of high morale, and, as one element of it, of military character, and it may perhaps be doubted whether military character is in reality capable of being created by outside influences. Its creation can certainly be influenced by teaching and environment, however; and this statement predicates that the teaching and suitable environment shall exist in the days that are formative of character. The first element necessary for the development of proper military character is of course the existence of high personal character, which should necessarily be inculcated in the child before it ever comes within the jurisdiction of the naval authorities. At a certain time, however, and in many if not most cases, the individual is turned over to us before the formation of personal character is completed, and the first step to be taken by the naval authorities must be to guard what has been well done in the formation of personal character and to further develop it; meanwhile endeavoring to eradicate and neutralize that which is not good. Concurrently with this effort begins the attempt to create high military character; that is, to erect upon such foundation of good personal character as we may find, a structure of special construction; a structure based upon the peculiar requirements of military and naval life. Many elements enter into this, some of which might not be greatly missed in civil life; but even there, it may truthfully be said that there is no element of high military character that would not be a valuable asset to anyone in any walk in life, and not only to the individual himself but also quite as much to those with whom he is associated and those to whom he renders service.

#### KNOWLEDGE OF THE PRINCIPLES UNDERLYING CO-OPERATION

The question of co-operation is one mainly, if not entirely, of personnel—of one's relations with other individuals. Of course, to co-operate with others in the performance of any particular duty, as in the conduct of a campaign, one must know and have the ability to perform one's own part in it, and also how to so perform it that in all its parts it will fit in with the parts of others. This may perhaps be termed the mechanical aspect of the affair, and this may be well done and the result still not be perfect. To breathe life



into the movement, it—the common cause—must receive from each principal actor in it that “last touch that cannot be commanded, but can only be given;” that “free contribution of the man to his defined duty” of which Hocking speaks in his definition of *morale*.

Therefore co-operation rests upon both ability and zeal; on knowledge and power; and on the ability to act toward a common end together with others over some of whom at least one may have no direct control. To do this successfully loyalty to plan, to mission, and to duty are requisite, and the first requisite for this is *indoctrination*. *Indoctrination* means a knowledge of plan, not in the narrow sense of some particular plan, of certain written orders, of some particular campaign plans, etc., alone, but of the spirit and purpose underlying and inspiring the whole operation. In no work of magnitude, different details of which must be undertaken by subordinates not under the immediate control of the commander, can specific plans cover all contingencies; it is always the unexpected that happens; therefore indoctrination in principles is vitally necessary, for it is only through such indoctrination that widely separated officers can successfully act in unison in furtherance of a common purpose. Indoctrination thus furnishes the common basis for operation, and loyalty will then supply the moving spirit.

On their face these remarks apply to co-operative action between equals in command; to such cases as, on the one hand, the operations of allied forces not under a unified command; and, on the other, the movements of a number of flag officers of equal force and authority, as force or squadron commanders, serving perhaps under a common commander-in-chief, but carrying on detached operations in unison in the same general area. Such a case as the latter is that in which several scouting forces, with supports, are covering a certain area, under the general direction of the commander-in-chief, who is perhaps well to the rear with the main force. Nevertheless the same principles apply with force to such lesser situations, and even to officers under the more direct command of a common superior; as is the case with the heads of department on board ship—to make an efficient ship, these officers must supply the same spirit of co-operation among themselves,

even though the eye of the captain be immediately upon them. And the captain must co-operate with them also, otherwise their efforts cannot succeed.

In the last analysis the proper performance of duty by his subordinates will rest upon the actions of the commander-in-chief himself. Unless he adheres to the principles with which he has indoctrinated his subordinates, unless he himself acts in full loyalty to the purpose and mission to which he has formed the loyalty of his subordinates, he can expect little in the way of results except confusion. As a lesser example, a captain demands the co-operation of his heads of department, but they can do little or nothing to produce good results unless they receive the heartiest possible co-operation from captain *along the lines which he has himself laid down for them to follow*; action on his part eccentric to accepted principles and purposes will nullify all the benefits resulting from proper indoctrination.

And a most important feature of co-operation lies in what is commonly known as the *initiative of the subordinate*; that is, in the ability and the right of each subordinate, in the face of unforeseen conditions, to act upon his own initiative, according to general principles, and, under some circumstances, even in contravention to his existing specific orders, with a view to furthering to the utmost the broad purpose of the senior in command.

Co-operation therefore depends upon ability and strength to act, upon loyalty to commander and to purpose, upon thorough indoctrination, and upon the right and ability of the subordinate to act wisely on his own initiative when necessary. And accompanying this right of initiative must manifestly be a thorough psychological understanding of those in conjunction with whom one is trying to work. In fact, when we say that a subordinate has been thoroughly indoctrinated by his commander-in-chief, we mean that he has been taught to think, in any sudden emergency, as the commander-in-chief himself would think were he there present; that is, the subordinate must mentally put himself in the place of the commander-in-chief and, knowing the general end in view, must decide what the commander-in-chief would order him to do were he cognizant of all the circumstances and in a position to issue an order covering them. The strength to exer-

cise initiative is of course a matter of character, but we see that the phase of such initiative that involves the preliminary decision as to what to do is in reality a matter of almost pure psychological reasoning; of deciding what someone else would do in the face of certain given conditions.

As co-operation rests upon a foundation the several elements of which have just been enumerated, so the building upon those elements becomes a case of personal co-operation; of co-ordinating within one's self the several elements involved, giving due weight to each, and finally the furnishing from one's own character of each of the necessary elements in due proportion.

#### KNOWLEDGE OF THE CHARACTER AND TEMPER OF NATIONS AND PEOPLES

The question of a necessity for an understanding by a high commander of the character and temper of nations and peoples has been touched upon in the discussion of psychology, but there are certain phases of this particular subject that makes it advisable to give it some consideration as a specific topic in itself. Primarily it may be said that, if operations of war are to be continuously successful, the military forces employed must be upheld by the people of the nation prosecuting them and of its allies. Therefore those charged with the conduct of such operations must understand such nations and peoples. Furthermore such operations must be so conducted as to most greatly oppress the adversary nation or nations and their peoples, from which it follows that it is necessary to understand them; for here we mean not only actual physical oppression, but such oppression as will weigh most heavily upon such adversaries mentally and morally, such as will most quickly reduce their morale and their will to resist. In planning a campaign the question must therefore be asked: "What operations will most encourage and be most strongly supported by our own and by our allied nations and peoples; and what will most depress and be most ineffectively opposed by hostile nations and peoples?" In deciding upon a plan of campaign, much weight must be given to the answer that we find in this question, and, together with the principles of strategy and even as a part of strategy, consideration of these points will lead to the final deter-

mination of a plan of campaign. It is partly the answers to this question that make the offensive the most advantageous form of campaign whenever our resources and other considerations permit us to take it. As local offensive action, if well conceived and well executed, raises the morale and courage of the unit that takes it, so an equally well conceived and executed general offensive raises the morale of the nation and people that stand behind it.

Therefore a thorough comprehension of this subject is of the utmost value to those who are called upon to plan and conduct military operations, and in acquiring such knowledge and understanding it is necessary to weigh justly and correctly the several elements that go to make up a nation. In the first place there is the ruler of the nation, who must be understood if possible, both personally and as to his power over his people. Then there is the hierarchy of officials, civil and military; then the two military services each as a whole, apart from the higher officers of each; although of course in a perfect organization these should be as one, still such is not always the case. Then there is the people of the nation as a whole, which is undoubtedly divided into several groups, several schools of thought. Which of these groups of thinkers will determine the actions of the nation as a whole? The question is one as to what the people think first as individuals, second in the several groups, and finally as a whole; that is as a nation; and upon an estimate of all these, not always correctly made and not always possible, will depend the failure or success of plans. Therefore it is evident that a correct appreciation of all such elements is necessary to the perfect planning and execution of wars and of campaigns. And it will be apparent also that we must not only justly appreciate all the elements in the case of our enemy, but that we must understand our own people and the peoples of allied nations in the same manner.

*(To be concluded.)*

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## AN IDEAL NAVY SUPPLY DEPOT

By LIEUT. COMMANDER WALTER D. SHARP, (SC) U. S. Navy

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The study of every element of the art of war has, of course, received a marked impetus from the recent world conflict and the results of this study are evidenced by the efforts to secure adequate and efficient fighting units, properly equipped bases, sufficient personnel, armor and armament.

The subject of logistics has, of course, received the attention its importance merits and the writer does not presume, even were he able to do so, to add anything of material value to the knowledge of logistics in its broad sense. He does feel that his war experience with the particular function of supplies for expedition units, his more or less intensive study of the very necessary part of the work his corps has to do and the absolute necessity to the very existence of a fleet or ship in commission, of a positive, logical and continuously operating scheme for furnishing the thousand and one items of supplies demanded by a ship in active service warrant him in submitting to the service the following paper.

By way of introduction it is but repetition to state that war is a business and every business to be successful requires a definite policy and plan of operation; therefore as the service of supply is a part, and a very necessary part of the business of war, some plan and a very definite plan of operation must be determined upon in advance of actual hostilities.

The writer, therefore, assumes as a condition a war in the Pacific and that the operating base will be San Francisco Bay. On this assumption he submits a definite plan worked out on the basis of the requirements of an active fleet operating from this bay as its base.

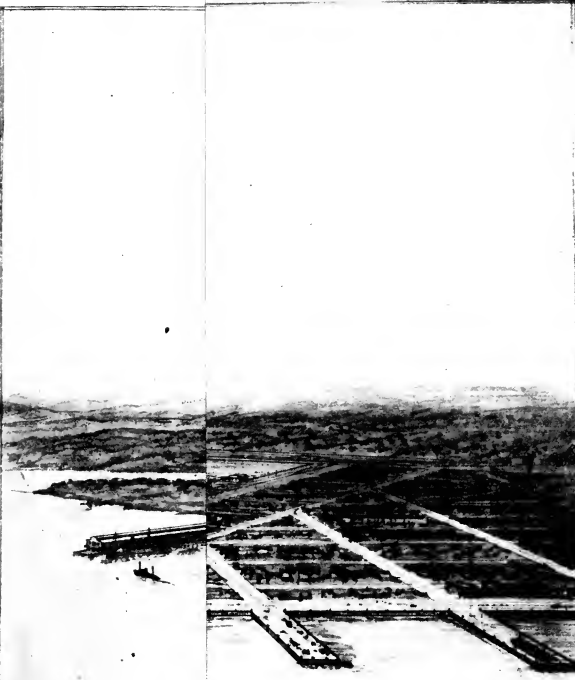
Now, without entering into any discussion as to the relative merits of any particular site within the limits of the bay, for all necessary facilities the writer will confine himself exclusively to the question of supply.

There is now at the Navy Yard, Mare Island, a Supply Department adequate for all industrial purposes and which is the only establishment of its kind in the vicinity supplying both the fleet and industrial units, but all officers agree that in the event of war it would not only be desirable, but rather a necessity, to establish some additional machinery for distributing supplies to the fleet, adjacent to the fleet anchorage, as well as to the best local market community, of course assuming proper railroad service and water front facilities.

To establish such a station after war has begun is not only attended by the confusion and rush of war conditions but involves an unnecessary expense and sacrifice of efficiency. Being familiar with the inception and execution of the same project at South Brooklyn and having had experience with its operation during a critical period I cannot escape the conviction that good business practice dictates as the only course to pursue provision for all facilities the necessity for which can be foreseen prior to the outbreak of hostilities. To formulate such a project requires, of course, an intimate knowledge of the demands, the sources of supply, the order of housing, with due regard to transportation facilities both water and rail, and the working organization necessary to handle it.

In preparing this plan I have assumed the area, the buildings and the water front, together with rail connections which I believe to be the minimum for the requirements.

While it is not the purpose of this paper to suggest a definite site for this depot, the suggestion is here made that there should be in the files of each district a broad, comprehensive and concise plan for such a depot, together with such additional information as may be available which may result in converting existing facilities to the purpose outlined herein. Besides this and of equal importance, until funds for the permanent building can be obtained, there should be prepared after careful investigation a confidential scheme for the utilization by commandeering of the best



PROPOSED SUPPLY DEPOT

FOR THE U. S. NAVY.

Lieut. Commander Walter D. Sharp, U. S. N.

*W. D. Sharp*

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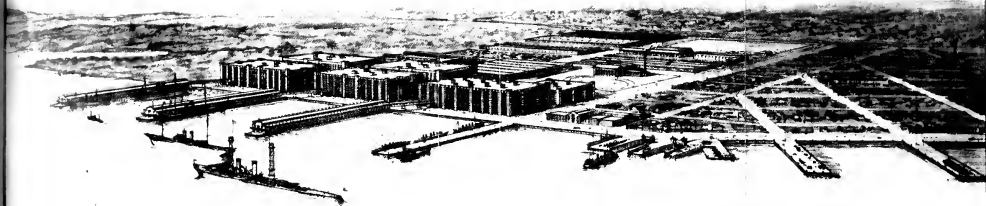
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FOR THE U. S. NAVY.  
Planned by Lieut. Commander Walter D. Sharp, U. S. N.

*W. D. Sharp*  
Lieut. Commander, U. S. N.



(D) **ORDNANCE STOREHOUSE**—6 floors, (1,566,000 square feet). Especially designed with overhead cranes and heavy load elevators for the handling of torpedoes, guns, gun mounts, etc.

(E) **SPECIAL STOREHOUSE**—10 floors, (2,600,400 sq. ft.) This building is intended to serve the following purposes, the space being assigned as the needs of each require.

**SHIP'S PEACE AND SPARE EQUIPMENT**—The floors reserved for this purpose will be fitted with cages and lockers in which ships may store spare equipment and for landing "peace equipment" when stripping for battle. Such lockers will enable the ships to continue to carry this equipment on their books and withdraw the same at will.

**SHIP'S OUTFITTING**—The floors reserved for this purpose will be caged for the assembling of ships' outfits and supplies before commissioning.

**SALVAGE**—The floors reserved for this purpose will be utilized in the receipt, segregation, survey, reconditioning, sale or other disposition of all used material received from whatever source.

This function assumed large proportions during and immediately following the recent war. In August, 1918, the writer, foreseeing the need of an organization and facilities for handling the enormous quantities of material which would be "turned in" by ships of all classes, training camps and other local war time units, as well as the stations abroad, endeavored to interest the Department in the establishment of such an organization but without result. The question was again brought up in the summer of 1919 and was approved, but not, however, until the greater volume of material had been received. This placed a great strain on the Supply Departments which were bending every effort to outfit and supply the transports, with the result that the receipt, care, reconditioning and disposition of the material did not receive the attention it deserved. The fact that the object to be attained differs from that by a Supply Department emphasizes the necessity for a separate department for salvage purposes. Though the strain of the receipt of such

material was greatly relieved by the time the Salvage Department to which I refer, began to function, the results, coupled with the great reduction in the operating charges, amply justified its existence.

(F) COFFEE ROASTING PLANT—Specially constructed to suit the needs of the service in roasting and supplying coffee.

(G) COLD STORAGE PLANT—(716,400 square ft.) This building to be of modern construction and fitted for the receipt, inspection, freezing and preservation of fresh provisions.

(H) MACHINERY STOREHOUSE—I floor and mezzanine, (585,000 square feet). This building is intended for the storage of construction and repair and engineering machinery, pumps and boiler and condenser tubes, etc.

(I) PAINT AND OIL STOREHOUSE—I floor and mezzanine, (558,000 square feet). For the storage of oils, paints, soaps, asbestos, fire brick, etc., with one section separated by fire walls for acids. The sections reserved for the storage of oils to have floors graded and floor drains to permit of flushing.

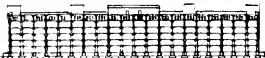
(J) MISCELLANEOUS OUTSIDE STORAGE—For life rafts, condemned boats and other miscellaneous material which will not be damaged by exposure. This lot will also serve as a "catch all," a necessary adjunct to any Supply Depot.

(K) POWER PLANT—Adequate to supply all power required by this depot. In the basement of this building will be located an incinerator for burning waste, etc.

(L) RACKS—For miscellaneous metal plates and shapes, used largely for construction purposes.

(M) PLATFORMS—For anchors, chain and shafting, with rests for anchor stocks.

(N) SHEDS AND OPEN AIR STORAGE—For lime, cement, sub-soil pipe, etc., brick, rails and rail connections, piles and other material usually required by the Public Works Department. The writer knows of no station where public works material is not scattered all over the yard in whatever space may be available for the moment, first here and then there, with added cost as a result.



COLD STORAGE



ONE / TOR

LUMBER

PROPOSED SUPPLY DEPOT  
FOR THE U.S. NAVY.

Planned by Lieut. Commander Walter D. Sharp / C U / N

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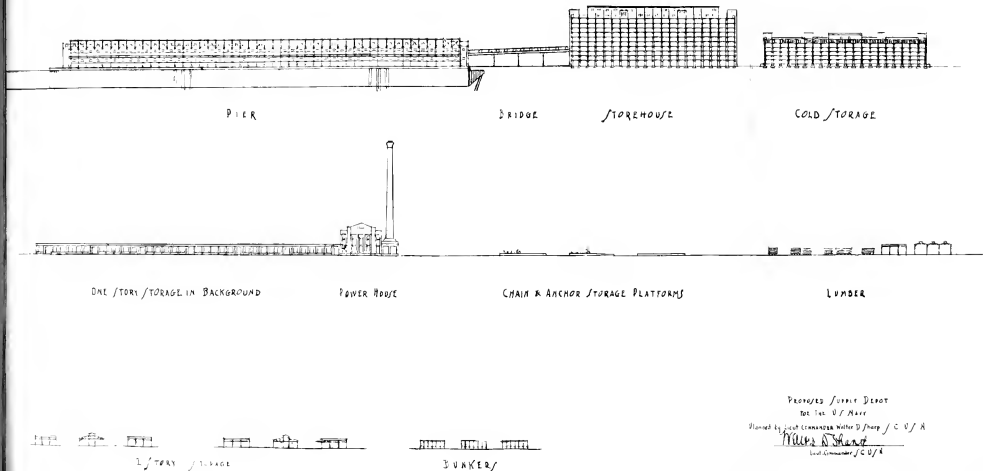
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PROPOSED NAVY SUPPLY DEPOT





(O) LUMBER SHEDS—Sheds and outdoor spaces for the storage of lumber. These sheds to be after modern design.

(P) FUEL OIL. In this section will be located the fuel oil pipe lines manifold pits connecting the several "farms" in San Francisco Bay with this depot and from which, in case of necessity, lines may be run to the oil wells of California.

(Q) In the space assigned for the manifold pits will also be located the Sub-Power Station for pumping oil to the ships' sides. This section may also be used as the depot "farm" for miscellaneous outdoor storage.

(R) For underground gasoline storage and facilities for filling drums for issue.

(S) BOAT STORAGE SHEDS, of modern design.

(T) BINS—For sand, gravel, coke, and scrap metals with magnets, metal saws, etc., for handling and breaking up scrap metal.

(U V W) PIERS—To be of double deck construction with elevators and connected with the main buildings by covered runways to permit of loading and unloading vessels without recourse to the use of automobile trucks. This permits of material being taken from the shelves, placed on the electric floor trucks and trailers and placed alongside the ship with a material saving in cost of delivery over the present method.

(X) UNCOVERED PIER—Equipped for filling the fuel oil tanks of vessels, etc., and for other purposes.

Speaking generally the equipment for handling material economically and expeditiously is of equal if not greater importance than storage and may be described as follows: The main buildings to be connected by covered bridges, ample railroad trackage connecting all groups and piers; locomotive cranes, overhead cranes; electric trucks; spiral chutes; elevators; racks; bins; shelving; cages; special inspection equipment; dark rooms for rubber; metal saws; box making machines; cross cut saws; planes and wood turning equipment; reel stands; cable measuring machines; lockers; locker rooms; washrooms; lavatories; recreation rooms; lunch rooms; etc.; and all floors to be fitted with fire sprinkling apparatus and signal equipment.

In order to picture the ease with which a vessel may be supplied by this depot, if equipped as outlined above, one has but to visualize a ship lying alongside one of the piers. A requisition for 2,000 sacks of flour has been received by the supply officer and he has touched the button which will put in operation the machinery for making delivery. The stockmen receiving his instructions "break out" the sacks, located on one of the upper floors of the provisions storehouse, drop them to the second floor by means of spiral chutes where they are loaded on trailers which are picked up by an electric truck, operated by one man, hauled over the runway to the upper deck of the pier and placed alongside the ship, where they are received, carried or hoisted on board and stowed.

In the case of lumber, anchors, chain, etc., flat cars will be placed alongside the sheds or platforms, loaded and hauled to the lower deck of the pier alongside the ship, where the material will be hoisted aboard by means of the pier or ship's equipment.

No provision has been made for special technical material required for the aeronautic service, it being understood that store houses for such will be located at the air stations.

It will also be noted that no reference has been made to a coal-ing plant which is of course a necessary unit of every supply group. Such was purposely omitted as there is already in San Francisco Bay a plant sufficient to care for present needs and susceptible of reasonable expansion. It is not believed that an additional plant will be necessary in view of the gradual decrease in the number of coal burning ships.

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A NOTE ON OFF-SHORE POSITIONS AS DETERMINED  
BY SEXTANT ALTITUDES OF DISTANT  
MOUNTAIN PEAKS

By COMMANDER J. L. SCHUYLER, U. S. Navy

1. On the Pacific coast—unlike in most other parts of the world—it is very often possible to see known mountain peaks beyond the horizon. And without tables—but using the following simple work form, distances are obtainable, which, there seems reason to believe, may often be rather more accurate than those which ordinary navigational sights would give.

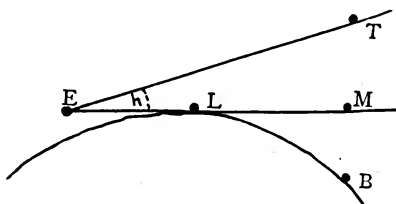


FIG. I

2. The above is an exaggerated figure where E is the position of the eye, T the top and B the bottom of a peak H feet high and D miles distant. Assuming the eye 46 feet above the sea, the horizon at L is 7.8 miles distant (Table VI, Bowditch). The line tangent to the horizon at L cuts the peak at the point M, so that only the top part TM is exposed to view. Hence in measuring the altitude as 0 minutes, we are setting the angle where tangent is

$$\frac{TM}{6080D}$$

3. The distance from M to L (in miles) equals  $1.15\sqrt{MB}$  (from a formula given page 346 Bowditch 1905). Since ML is (D-7.8) we can write  $\left\{\frac{D-7.8}{1.15}\right\}^2$  for MB.

$$\text{Then } \frac{TM}{6080D} = \frac{H-MB}{6080D} = \tan TEM \dots\dots\dots I$$

$$\text{Or } H - \left\{\frac{D-7.8}{1.15}\right\}^2 = b \times \tan^2 \dots\dots\dots II$$

$$\frac{\quad}{D6080}$$

4. Clearing this as an equation in D,  
 $O = D^2 + D(2.34h - 15.6) + (61 - 1.32H) \dots\dots\dots III$

and the desired root of this  $D = \frac{-b}{2} + \frac{1}{2}\sqrt{b^2 - 4C}$

or  $-\frac{b}{2} + \sqrt{\left(\frac{b}{2}\right)^2 - C} \dots\dots\dots IV$

where b is the coefficient of D and C is the independent term in equation III.

5. The first part of this,  $-\frac{b}{2}$  is (from III), simply  $-(1.17h - 7.8)$ . And to get the second member, this need only be squared,  $(1.32H - 61)$  added, and the square root extracted.

Combining the two parts gives D, the distance in miles and, if the omnimeter is used, this arithmetrical work is quickly done. For instance, study the following actual example of a peak 3,950 feet high where the sextant altitude measured 32.5 minutes and results were within half a mile of the navigator's position as fixed by the ordinary sights.

(Form for height of eye 46 feet.)

h (minutes) .. 32.5... $\times 1.17 = 38.1$		
	$- 7.8$	$- 61$
	<hr/>	$(A)^2 = 918$
	(A) = 30.3	
H (in feet) = 3950		
	$(B) = 77.9$	$1.32H = 5210$
	<hr/>	$(B)^2 = 6067$
(B) - (A) = D (Distance in miles) = 47.6		

6. A 100-foot error in this mountain height throws one out only .9 of a mile and errors of one minute in altitude affect the position only .4 miles, or .4 times as much as a corresponding error in a sight. So even if one does not care to use it, it is perhaps interesting to see that such work is rather more accurate than one would at first suspect.



## DISCUSSION

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### Officers for Shore Duty Only

(SEE PAGE 1885, WHOLE No. 226)

CAPTAIN ELLIOT SNOW, (CC.) U. S. NAVY.—The article contributed to the December number of the PROCEEDINGS on the subject "Officers for Shore Duty Only" is so unfair in its statements concerning the construction corps as a whole that I, as one of the corps, am impelled to make this refutation. Wherever the article touches the construction corps, whether it be upon its ideals, its methods of realizing those ideals, or its achievements, the writer displays much ignorance. If this be not soon pointed out, the article will have conveyed a lasting wrong impression to the uninitiated layman outside the service and to many officers in it. Thereby, the author presumably unwittingly will have perpetrated a great injustice to the members of that corps.

The author's opening sentences aroused high hopes as regards his article, but it was a sad disappointment to find it largely made up of generalities, with a large admixture of very inaccurate statements.

The subject is one that has been discussed by naval officers in one form or another ever since we had a navy, and doubtless its discussion will continue as long as we have a navy. It, however, comprises a question that is too large and involved to permit here a full discussion, so I shall restrict myself to specific points.

It is difficult to understand just what the author has in mind in many places. For instance, after a brief description of the present method of obtaining and handling specialists, the author says:

It does not appear to the writer that such procedure can, with the wildest stretch of the imagination, be expected to produce the kind of specialists which the navy is in need of. There would appear to be two basic reasons for this: (a) The navy is approximately seventy-five per cent an operative and twenty-five per cent a building and repair problem. (b) Specialists who depend upon their work for a livelihood, and the monetary return from whose efforts fluctuates with their ability to please their clients with their work, are usually amenable to a suggestion from those who have to operate the product of their especial training; in other words, they meet the conditions imposed by their clients as far as it is possible to meet them.

The cryptic utterance (b) above is not again referred to nor further explained. I assume that it is intended to convey one of two ideas, either that navy specialists are too amenable to the operative side, or that they are not sufficiently so amenable. I have been unable to decide which one was intended.

The author's statement that:

. . . the construction corps of the navy seems honestly to believe that a constructor can learn little by recurring tours of sea duty. seems worthy of comment. While I cannot speak for the whole construction corps, I do not believe that their attitude is quite that ascribed to them by the author. By recurring tours of sea duty, any constructor would learn much; the value of sea experience has never been minimized or belittled by the constructors. Unfortunately they have been confronted by a condition—not a theory. During practically my whole experience in the construction corps it has been woefully shorthanded, and it has been necessary to keep virtually all of them on shore duty. The work to be done there must be taken care of. Conditions are changing and apparently it will soon be possible for many more constructors to get experience at sea.

I do not agree with the author, however, in his line of argument, that the main value of sending such officers to sea would be to strengthen recommendations from ships for changes and improvements and thus give them a better chance of getting by. The author seems to share the impression of some other officers, I hope a small minority, that the construction corps knows little and cares less about the comfort of those who go down to the sea in ships.

The question of alterations of and improvements to ships is perennially with us. It is not a very live one at present, since, owing to short appropriations, general orders forbid changes not absolutely necessary for military or sanitary reasons. If the author will study or even carefully read chapter fifty-one of the current *Navy Regulations*—"Repairs and Alterations to Ships"—he will find that *a chief of bureau cannot disapprove an alteration*. An alteration disapproved by the Board of Inspection and Survey is practically dead and need not even be carried to the estimate stage. This board is required normally to pass upon alterations, and, as is well known, it is composed mainly of seagoing officers. Delays in acting upon recommended alterations are principally due to the requirement that the board must pass upon them as a regular routine.

Action upon alterations recommended by the Board of Inspection and Survey must be taken—not by the bureau concerned—but by higher authority. In practice, certain recommendations for alterations, mostly minor, that are not passed upon by the Board of Inspection and Survey, reach the bureaus. *These can be approved by the bureau concerned, but cannot be disapproved except by higher authority.*

As regards alterations desired by a ship, I rather think, taking things as they are and not as the author supposes them to be, that the presence of a naval constructor on a ship would not have the effect conceived by the author.

The author must have had some sad experience with ventilation, aboard ship, but his statement that "The ventilation as installed does not do what the calculations stated it would do," is a sweeping one as he apparently



intends it to apply to all ships. Nearly twenty years ago the Bureau of Construction and Repair reduced the question of ventilation to a more scientific basis, and eliminated the former rule-of-thumb methods. Now ventilation systems when designed are made the subject of careful advance calculations. The ventilating systems as installed are actually tested on new ships, and it is a matter of record that they do deliver air in close agreement with the calculations. It is not the practice to ignore results as the author seems to think.

If a ventilation system under service conditions delivers a volume of air that is materially less than on test, the condition can be due to but one of two reasons: either the ducts were not kept clear of rubbish or the system was not operated properly.

On pages 1888-9 the author makes a number of sweeping statements as regards things which are wrong in the army and navy. These he apparently ascribes to the fact that work was handled by a corps, or by what he regards as the equivalent of a corps. For instance, with reference to the condition of naval ordnance prior to 1899, he says:

It will be found that our naval ordnance was of such flimsy construction and so inaccurately built as to make it almost useless.

This is a very sweeping statement and surely must be exaggerated. At any rate the service at the time certainly did not believe that any such condition existed. The author states that he is:

. . . convinced that the method pursued by the Ordnance Bureau during the years immediately prior to the Spanish war made what was practically a corps out of the bureau and its activities, in that the bureau became a self-perpetuating body with a permanent head, with the result that it had all the mystery and obstruction of the other corps; and this mystery and obstruction retarded naval ordnance evolution immeasurably.

A little later on he speaks of officers in the Bureau of Ordnance being

. . . returned each recurring shore duty to their old positions in the bureau, and who, through the peculiar kind of loyalty they thought they owed to ordnance, whose chief had been a fixture for twelve years or so, had that much incentive to be intolerant of suggestion from those who had not the inspiration which exists in the atmosphere surrounding the chief of the corps.

Here, as in many other places throughout the articles, the author's statements appear to bear but little relation to the facts. For instance, there never was a chief of bureau of ordnance who served twelve years; and during the years immediately prior to the Spanish war there was absolutely nothing resembling a permanent head in the Bureau of Ordnance. It was headed by Commodore Folger from February 12, 1890, to January 2, 1893—about three years; followed by Commodore Sampson, later the commander-in-chief during the Spanish war, from January 28, 1893, to May 31, 1897—a little over four years; and then by Charles O'Neil from June, 1897, to March, 1904. The author apparently regards 1899 as the end of the old régime. Up to that time Admiral O'Neil had held office but two years.

The author appears to claim that, except for the corps system, improvements made ultimately would have been made years before. Of course this is an opinion and not a demonstrable fact. It would be interesting to know in more detail various alleged facts upon which the author's opinion is based. For instance, on page 1889 he alleges that:

. . . we had been likewise for years gravely calculating the necessary horsepower to drive hulls at a given speed only to find when we actually drove the hull at the designed speed that the horsepower necessary bore no relation to that we had calculated.

It is not clear to just what period of time this refers. The author appears to admit that naval ordnance and naval engineering saw the light in 1899, but that naval construction apparently has not yet seen it. Certainly, however, during the last twenty years when model basin facilities have been available for horsepower estimates, there has been no case of a naval vessel where the horsepower estimated bore no relation to that on trial. It would be interesting if the author would be specific as regards this allegation; giving the names of the vessels he has in mind, stating their designed and actual horsepower, and the proportion of these vessels to the total number built. In spite of the fact that our methods for estimating horsepower are more accurate than those of thirty years ago, it is believed that the author's statement, which would seem intended to apply to all naval vessels, is, to put it mildly, a gross exaggeration.

Further, on page 1895 the author says:

. . . it might be stated that it is exceedingly probable that had the first-class ships of the navy each had a naval constructor attached to it, the improvement in stream lines of battleships would have been made very much earlier than was the case, as they would have had daily and practical demonstration of the remarkably inefficient stream lines of all our battleships up to the evolution of the dreadnought.

The alleged demonstration of the inefficient lines of our battleships could only appear when the vessels were steaming at or near full speed, so that the author's claim that "they would have had practical demonstrations daily" is obviously grotesquely in error. I doubt if under the circumstances of twenty-odd years ago, any demonstration in this connection occurred once in fifty days. Moreover, even if there had been daily demonstrations, the constructor attached to the ship, as a rule, would never have seen anything not already perfectly well known to the naval constructors responsible for the design.

When a new type of ship was tried, careful observations and records were made of the wave disturbance created, and in most cases, in addition to the trial board, officers attached to the design branch of the Bureau of Construction and Repair witnessed the trials for the purpose of studying these very matters under the most favorable conditions.

The author's opinion that the stream lines of all our battleships up to the dreadnought were remarkably inefficient is not warranted by the facts. Our early battleships were not required to make high speeds, and hence were made as short as possible; this resulted in a good deal of wave dis-

turbance at top speed. As top speeds increased with the approach of the dreadnought era, the vessels were made longer and the lines were made finer, and the results of careful model basin experiments which were available after 1900, were used to improve their forms. The author has, evidently, not grasped the fundamentals of resistance and propulsion and yet he presumes to criticize. If he would take the time to look up this question, he would discover the well-known fact that the primary requirement in connection with high speed of ships is an adequate length appropriate to the speed, and that while of course the form does affect the resistance, the practicable variations due to form are comparatively minor compared with those due to length. For instance, when the *Chester* and class were designed, about 1904, it was found that for a given displacement, and very high speed, the horsepower required for a length of 450 feet would be less than one-half that required if the vessel were made but 350 feet long.

If he proceeded a little further into the realm of the specialist, the author would discover, strange as it may seem, that as regards the vessels which he considers have remarkably inefficient stream lines and which pushed ahead "water which was only too anxious to get by," it might have been a mistake to adopt greater length resulting in easier driving form. There would be some saving in horsepower at top speed, but length is undesirable from every other point of view. Increase in length means more weight of hull, more weight for protection, and more power at cruising speed. More power at cruising speed means more fuel to be carried for endurance at cruising speed.

The mere fact that at maximum speed and over a range of but a knot or so, a battleship makes a strong bow wave, does not necessarily justify the conclusion that the specialist did not know what he was doing and would have prepared a different design if he had had a three years' cruise upon some other ship.

Some years ago American destroyers were making their speeds with about two-thirds of the power of contemporary British destroyers of about equivalent size and speed.

This, however, did not show that the British constructors were in error in adopting what the author would undoubtedly call "inefficient stream lines." At that time the British engineers were developing a horsepower on much less weight than we were. Getting their horsepower so cheaply as regards weight, it was justifiable to adopt decidedly shorter boats with the many attendant advantages and to accept for top speed the high resistance, necessarily incident to reduced length. Even to this day the British destroyers, all things considered, are relatively shorter than ours.

Thus far, I have restricted my comment to those statements of the author concerning matters about which I have personal knowledge and ready access to the facts. It is evident to me, as regards these matters, that his article may be correctly characterized as full of inaccuracies. The

author's onslaught upon other branches of the navy is possibly based upon more accurate knowledge than has been shown to be the case for the remainder of his article. It may develop, however, that these and the sweeping animadversions upon branches of our sister service, are also based solely upon personal opinion or gossip unsupported by facts.

The statement that the ordnance corps of the army, for instance, . . . designed and built the guns and mounts with practically no attention to suggestion from artilleryists of long experience; . . . and as a crowning achievement accomplished the feat of so redesigning the French 75, which had stood the test of four years of war, as to prevent the arrival of a single battery of American built 75s at the front before the Armistice.

is obviously one that should not be made unless the author knows of his own knowledge that it is correct. The army and the navy have suffered in the past, and seem likely to suffer still more in the immediate future, from circulation by people outside the service, of grossly erroneous statements and unwarranted attacks. Any such allegation coming from an officer of either service, is liable to be taken up, exaggerated, and circulated as being unimpeachably correct.

At the end of his paper the author, having devoted a number of pages to the question of shore duty, his nominal subject, winds up with a bald statement that naval constructors should be amalgamated and recites eight reasons for this view. His underlying idea appears to be that the corps of naval constructors can get no sea experience unless they are amalgamated with the line. But the majority of the eight reasons given for amalgamation have no real bearing on this line of thought. Already there are several corps of specialists—who do sea duty regularly, and there is nothing in the law to prevent the construction corps also from being thus detailed.

As I stated in the beginning, this is too large a question to discuss in detail in connection with this paper. It seems to me inevitable that if there be amalgamation with the line, and line officers do the work now done by the corps of naval constructors the end would be similar to that which obtained when the line officers did the work of naval ordnance prior to 1899. In other words, they would alternate with sea duty and naval construction duty on shore.

The author states that prior to 1899 (the date of amalgamation) "our engineering departments on board ship were in a deplorable condition." However, he does not discuss the present condition of our ships as regards engineering. There are many seagoing officers who consider the present conditions as distinctly susceptible of improvement. The thought occurs to me that assuming present engineering material conditions and the existence of a separate engineer corps, as in 1899, would there not be a much better chance of improvement if outspoken constructive criticism and insistent demands for improvement were made by operating officers? True, there would be more friction, but any motion involves friction. Only the quiescence of rest is frictionless.

I desire, in conclusion, to call attention to one point which is seldom brought out in discussions of amalgamation. As a fundamental question of organization, is it at all wise or even desirable that those who operate should be the same people who design and build? The product operated must of course be in the end satisfactory to the operators. Is there not some advantage in having the designers and builders segregated to some extent from the operators, even to the point of a certain lack of sympathy with resulting friction? We then insure that the operator is a fearless and unbiased critic of the product of the designer and builder. The designer and the builder in turn, if he keeps the open mind that he should, cannot help but profit from constructive criticism temperately offered. This attitude clearly insures the early detection of, and insistence upon, the correction of errors and shortcomings. Let us suppose, for instance, under the author's system, that an officer designs a ship, superintends its construction, and then commands her in service. This appears to be quite possible under the author's contemplated amalgamation. Human nature is one factor which is unchangeable in this world, and certainly this human characteristic would result in the commanding officer of that ship being "to her faults a little blind, to her virtues ever kind." Is that a desirable situation?

The article closes with this statement:

It follows that the abolishment of "for shore duty only" among constructors and engineers is an essential to increasing service efficiency and, while it will undoubtedly be opposed by some, *the service would do well to look with care at the true reason for such opposition.*

The warning given implies that opposition to amalgamation may be made from unworthy motives. Evidently the author does not realize that there are good and sufficient reasons against this step. There is a subtle confusion of ideas introduced by the author throughout the article and an uncritical reader might easily be led to believe that the abolishment of "for shore duty only" is the same as "amalgamation." They are in no sense the same nor even equivalent.

Amalgamation of the construction corps with the line will violate a fundamental principle of organization as it means the complete coalescence of two corps whose lines of training, thought and life work are radically different. Although they strive toward a common end—the defense of the nation.

It will strongly tend to stifle all honest criticism of the construction materiel of the navy.

It will pave the way to a complete disorganization of the industrial branch of the navy at the outbreak of war.

### Practical Lessons for American Navy

(SEE PAGE 1877, NO. 226)

CAPTAIN B. C. DECKER, U. S. N.—In the December number, there appears on page 1882 this remark, "That no commander could be justified in entering a known torpedo area with capital ships is certain." This is given in an article on "Practical Lessons for the American Navy." On page 1859

there appear Farragut's famous words "Damn the torpedoes! Go ahead!" Words that are "treasured and carried along to remind us what stuff our predecessors were made of."

The lesson set forth does not say more than that a known torpedo area is to be avoided, so that we can reasonably conclude that our imagination is to place torpedoes wherever they might have been fired and avoid the area. This would naturally lead to an indecisive action since at any time a fleet could fire torpedoes and run away.

But why avoid a torpedo area? Is it because of possible injury to ships? We cannot expect to win a fight without receiving injuries, the point to be decided will be the value of the objective. Farragut expected to lose some ships but counted on having enough left to accomplish his mission.

If we consider the Battle of Jutland we might be tempted to state the lesson in such a manner as to keep out of gun range, since three battle cruisers were sunk by gun fire, while the number of battleships injured by torpedoes was less. Though we know the English battle fleet passed many torpedoes, or were passed by torpedoes, only one was injured, but the result was the forcing of this great force out of action until the German fleet made another attack. Little or no harm was done by the torpedo attack, but great harm resulted from the imaginary possibilities of this form of attack.

The writer of the "Lessons" states "It seems more like superior marksmanship" that sank the three English battle cruisers than lucky shots. It is known that some of the English and German battle cruisers received more hits in the course of the battle than the ships that sank, so the hits received by these ships must have been hits in a peculiarly vulnerable spot.

On page 1890, we find another writer ascribing the loss of these three ships to the lack of knowledge of British constructors, and their application of the same, of the accidents on the *Missouri*, *Kearsarge* and *Georgia*. Another writer might ascribe the loss to the faulty handling of the English forces by which in the case of the *Invincible* there was a concentration of two or more ships on the former, at a range of about 10,000 yards. In the case of the other two though they received but few hits, this might have been made more difficult by a rapid closing of range until the English were as sure to hit as the Germans, if a fight was to be carried on; or by remaining out of gun range if the strategy required this course. A long range action is just as objectionable today as in Nelson's time. A long range is a range at which the percentage of hits is so small, that all are chance hits. A short range is one where the chances are more than even for hitting under battle conditions, which means being hit. Such an action should be decided in half an hour. If the strategy calls for an action then the fight should be pushed with all forces, if it does not then it should be avoided.

The writer of "Practical Lessons," states that it is "inconceivable" that the British commander-in-chief did not desire to renew the action at daylight, but it is the only conclusion that a study of the disposition of the fleet during the night, can lead to. The distance was short, so that the fleet must

be united at daylight to make the attack, and no provision was made for this. The second in command did not join the flag until the afternoon; the battle cruisers until several hours after daylight, and the destroyers the same. The German forces were united at daylight. The wide dispersion of the English forces prevented that cohesion essential to having the fleet ready at daybreak for action. This was due to the fear of the destroyer that did nothing during the night to the English and little to the Germans. This was not due to lack of capable destroyer officers, because we know what they were willing to attempt to do, by the day action. But it was due to the inherent limitations of the craft, and the personnel. The latter had been under a terrible strain all day. *The correct estimate of a situation by the commander-in-chief will lead to success*, but it must be based on knowledge of personnel and materiel, as well as conditions, and not influenced by imaginary dangers to be correct. The English commander-in-chief had the choice of a fight at daybreak, or the academic night destroyer attack, but he could not have both.





## U. S. NAVAL INSTITUTE

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Lieut. A. J. Sellman, U. S. N.

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"as a station or place of resort for any warlike purpose or for the purpose of obtaining any facilities of warlike equipment; and no ship of war or privateer of either belligerent shall be permitted to sail out of or leave any port, harbor, roadstead, or waters subject to the jurisdiction of the United States."

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The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary and Treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

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Whole Nos. 6, 7, 10, 13, 14, 15, 17, 144, and 173 of the PROCEEDINGS are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 75 cents per copy.

ANNAPOLIS, MD., February, 1922.

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# PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT R. A. HALL, U. S. NAVY

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## FRANCE

FRENCH NAVAL OPINION—Despite the superficial optimism it is felt here that the Washington Conference has not advanced, so much as had been expected, the cause of international goodwill and peace, which underpopulated and war-ruined France has at heart more than any other nation, and which she shows by adopting towards treacherous Boche land an over-lenient attitude. The several incidents to which the active Boche anti-French propaganda has recently given rise have made a deep impression, even in those Paris political circles most hostile to militarism, and Clemenceau's advice is being recalled: "*Souvenez-vous que l'humanité ne changera jamais, et que la France pacifique doit, aux dangers spéciaux de sa situation géographique, d'être toujours prête au combat, sous peine de mort.*" Premier Briand was, of course, conciliatory and eloquent as always, but in Parliamentary quarters here the opposition is growing against a disarmament policy placing France at the mercy of her neighbours. Moreover, the anti-French outrages in Italy show Frenchmen that the dangers they have to guard against are many and that Mediterranean supremacy is to them a vital necessity.

No undue importance is attached here to the projected clauses limiting the displacements of navies. Size has never been, and never will be, the true measure of sea power. The 27 sea-battered ships of Nelson, with their seasoned and disciplined crews and their splendid officers, represented infinitely greater value than the odd collection of 33 lame ducks under Villeneuve. And with the changed conditions of warfare, and the growing

importance of strategic *points d'appui*, fuel dépôts, and repairing bases, a given number of warships express nothing more than possibilities and potential power, without moral and material preparedness for war, without ample financial expenditure capable of supplying a fleet with the up-to-date armament and the repairing and the strategic facilities it needs for successful operations in all seas. The 24,000 ton *Bretagnes*, for instance, have preserved on paper unchanged value; yet their offensive and defensive power has been increased by at least 50 per cent as the result of the costly modifications they have received. Their new shells have proved wonderful against the thickly-armoured *Thüringen*, that was sunk at a range of 14,000 mètres by 13.4-inch delayed fuse projectiles. Finances did it; finances alone permit constant sea practice and complete preparation for war in its many aspects. Therefore, financial expenditure is a better criterion of strength.

One of the reasons of the French indifference towards the Washington disarmament proposals is the prevalent belief in Parliamentary circles that a revolution is impending in the scientific line that will render obsolete most of the weapons of today, the mighty battleship included. The very limitations imposed on Germany and the suppression of the greater part of her existing and "visible" armament, by concentrating the whole Boche preparation in the intellectual field and in laboratories, will, of course, contribute to bring about the advent of new and more economical, swifter, and more deadly weapons that will make the devastating conflict of yesterday look like child's play in comparison with tomorrow's warfare. In the new game *Bocheland* has every chance to lead; her chemical production plant and laboratories are still easily first, despite the belated efforts being made in France, the several accidental explosions in German "agricultural works," and especially at Oppau, where the conflagration of "agricultural gas" caused an excavation 130 mètres wide and 30 mètres deep—these facts speak loudly enough of what is in store for *Bocheland's* enemies.

Count Zeppelin's son, head of the great and thriving Zeppelin aeronautical firm, speaking to a French officer, said: "It has been a good thing you stopped us in our work, for it has compelled us to look for new and better things, and we have found them. Hence my faith in the future of greater Germany." Député Fonck, who is considered here as the greatest living aviator, recently summed up a lengthy visit to Germany by saying: "From what I have seen or ascertained Germany has the means, within a few weeks' time, of excelling France in the air both by the quality and number of her aerial machines," whilst a French artillery general commanding on the Rhine has expressed his belief that as soon as Boche propaganda has succeeded in dissociating the Allies, Germany will strike and immediately assert her superiority in the aero-chemical warfare and reverse to her advantage the Versailles Treaty. Obviously, no disarmament clauses could effectively impede that novel line of war preparation that is wholly a matter of aggressive spirit served by industrial power.

The French submarine flotillas have been reinforced by the addition of ex-German boats, refitted and modified at great cost in the Brittany and Normandy arsenals. The *Marras* and *Autrie* (U-162 and U-105), of 850-1,150 tons and 2,200 h.p., do not compare well on paper with the French *Laplace* (950-1,250 tons, 3,000 h.p.) and *Callots* (932-1,300 tons, 2,900 h.p.). Their workmanship is poor, their conditions of habitability are defective, and their German motors do not work quite so smoothly as the Creusot-made Diesels in the latest Gallic submersibles. On the other hand, they are more robust, simpler, and more military, better armed, everything in them having been sacrificed to the fighting utilisation of the displacement. The great defect of French boats is to be "*trop parfaits*," too complicated and consequently too fragile, as the result of lack of practical sea training on the part of our *distingués ingénieurs de la marine*, but there are signs.

in post-war submersibles, that the experience of the real thing has not been lost upon the Section Technique experts.

The Senate Marine Committee is again urging the laying down next year of a larger number of submarines than have been provided for under the Guisthau programme, and the Chamber is expected to support this demand for a programme of submarines "*suffisant pour assurer l'entière sécurité des frontières maritimes*"—which is a matter of appreciation and may mean either a big effort or simply the usual shower of academic discourse. Senator d'Estournelles, who advocated the construction of exclusively defensive weapons, was reminded by Senator Berenger that there is no such thing as "*des armes purement défensives*," since the veriest mosquitoes sank two 20,000-ton Austrian battleships, and since also an avion-torpilleur may account for the heaviest battleship. Whilst the Chamber counts yet sturdy partisans of a "*flotte de combat*," the majority of the Senate has gone over to the side of *la Jeune Ecole* and acclaimed Constructor Breguet's recent prophecy: "*Les Dreadnoughts vont disparaître de la surface du globe comme ont disparu les monstres colossaux des temps préhistoriques*," though the wish was obviously father to the thought in this expression of the views of the famed aerial expert, who sees in the gradual disappearance of mastodons a splendid chance for aerial developments. The latter, however, make for a worse, more cruel, form of warfare than battleships did; and in this respect, indeed, pacifists and humanitaires are backing the wrong horse.—*Naval and Military Record*, 14 December, 1921.

**FRENCH AERIAL LIGHTHOUSE**—From France it is reported that the French Air Ministry has recently acquired a new aerial lighthouse which is said to eclipse entirely anything that has hitherto been attempted in the way of lighting up the air routes. The new lighthouse, which, it is stated, is to be erected on Mt. Africa, near Dijon, at an altitude of 1,500 feet above sea level, will throw a light which, in clear weather, it is expected will be visible for a distance of 200 miles.—*Aerial Age Weekly*, 26 December, 1921.

**THE STATE MERCHANT FLEET**—The fleet of merchant ships that was acquired by the State during the war has been disposed of under much better conditions than had been anticipated. Excluding the colliers, which will remain in the hands of the State for the time being, and the wooden vessels that were built in the United States and are regarded as having very little value, there were 400,000 tons for sale, and it was feared that the throwing of such a large quantity of shipping on the market would have had serious consequences in depreciating the prices obtainable. The Under-Secretary of State for the Merchant Marine succeeded, however, in grouping together shipowners who made a bid for the lot, the price, it is said, being quite favorable to the State and above that recently paid by Belgium for German vessels. The deal was carried out within three months of the passing of the Bill authorizing the sale.—*The Engineer*, 2 December, 1921.

**FRENCH TANKER FLEET**—When the war began, the French tanker fleet consisted of one steamer and two sailing vessels. French oil refining interests owned six tankers, but these were operated under the British flag and were subject to the orders of the British Admiralty for the whole of the war. At the present time there are 17 tankers of 159,700 tons deadweight being built for French accounts. All these are scheduled for delivery next year. By January 1, 1923, the French tanker fleet is expected to comprise 24 steam and sailing units of 200,000 tons deadweight.—*Nautical Gazette*, 17 December, 1921.

**FRANCE'S CARGO MOVEMENT**—During the first ten months of this year, the weight of French exports was 11,979,289 tons as compared with 10,228,783 tons in 1920 and 17,848,275 tons in 1913. Imports measured by

weight amounted to 27,615,983 tons in the ten months of 1921, as against 40,656,750 in 1920 and 36,426,434 tons in 1913.—*Nautical Gazette*, 24 December, 1921.

### GERMANY

**GERMANS REDUCE SOUTH AMERICAN FREIGHTS.**—The Hugo Stinnes Company for Shipping and Oversea Trade, Hamburg, and the Hamburg Agency of the "Artus" Danzig Shipping and Trade Company, Hamburg Branch, agreed to grant 20 per cent reduction in fares for passengers who travel to the Leipzig Fair. The steamers of the Hugo Stinnes Company call in Brazil at the ports of Rio de Janeiro, Pernambuco and Bahia; in Uruguay at Monte Video; in Argentine, at Buenos Ayres.

The steamers of the Artus Company call at Antwerp on the outbound route and in Brazil at Rio (for passengers only), in Uruguay at Monte Video, in Argentine at Buenos Ayres and Rosario. For the purpose of obtaining the above-mentioned reductions parties interested will have to see the Honorary Representative of the Leipzig Fair Bureau in the respective country, who will issue the necessary vouchers—i.e., in Brazil, Union of German-Brazilian firms, Rua da Alfandega No. 5; in Uruguay, Mr. Groscurth, member of the firm of Groscurth and Co.; Monte Video, Casla dos Correa 66; in Argentine, A. Hartrodt; Buenos Ayres, Calle Reconquista 81.

The above-mentioned reductions will take effect for the first time in the Spring Fair (March 5-11, 1922).—*Engineering and Industrial Management*, 24 November, 1921.

**GERMAN SERVICES RESTORED.**—The Hamburg-American Line and the North German Lloyd have renewed their pre-war joint service of cargo steamers from Hamburg and Bremen to East Asiatic ports. The restored service was inaugurated by the Hamburg-American Line's motor ship *Havelland* which was despatched last Sunday. She will be followed on January 7 by the North German Lloyd steamer *Westfalen*.

The Hamburg-American Line has also resumed its passenger service to South America with the steamers *Teutonia*, formerly the *Hapsburg*, and the *Rugia* which were repurchased from the Allies. These vessels have accommodations for first and third class passengers and will call at Rio de Janeiro and Buenos Aires.—*Nautical Gazette*, 10 December, 1921.

**THE GERMAN MERCHANT NAVY.**—The recovery of the German merchant navy is progressing at a very fair pace and during the present year the tonnage has increased from 428,000 tons to about 700,000 tons. At the larger German yards 45 vessels are stated to be in course of construction, and a number of foreign vessels are being purchased. Thus seven good boats of the Swedish Johnsen Line have just been transferred, much to the regret of the Swedes. Their aggregate tonnage is 46,340 tons deadweight and amongst them are the two sister vessels *Axel Johnsen* and *Annie Johnsen*, built at Lindholm some ten years ago, the first Swedish-built ocean-going boats. The types at present attracting most attention in Germany are vessels of 10,000 tons to 15,000 tons deadweight.—*Engineering*, 2 December, 1921.

**GERMANY'S FOREIGN TRADE.**—Estimated figures for Germany's foreign trade during September and October show that both imports and exports are increasing. Total imports for October are estimated at 3,000,000 metric tons, valued at 13,000,000,000 paper marks, as against 2,500,000 metric tons in September, valued at 10,668,000,000 paper marks. Total exports for October amount to 1,970,000 metric tons, valued at 9,700,000,000 paper marks, as against 1,870,000 metric tons in September, valued at 5,519,000,000 paper marks.—*Nautical Gazette*, 24 December, 1921.

**GERMAN MERCHANT MARINE TOTALS MILLION TONS.**—The German merchant marine has had a phenomenal growth during the last few months



states *Commerce Reports* and now totals around one million tons. Compared with the tonnage of July, 1921, this shows a gain of approximately 250,000 tons. In spite of the rapid increase in German shipping it is estimated that 80 per cent of the country's foreign trade is being carried in foreign bottoms. The share of the United States in this total amounts to 3 per cent.—*Nautical Gazette*, 31 December, 1921.

### GREAT BRITAIN

**BRITAIN'S NEW BATTLE CRUISERS.**—Early in September the Admiralty invited bids for the construction of the first four capital ships which have been authorized for the British Navy since 1916. They are officially described as "replace" ships, and before they are placed in commission at least eight of the older dreadnoughts will have gone to the junk heap. It is understood that tenders for the hulls, machinery, and equipment of the new ships have already been submitted by the leading shipbuilding firms, and an early announcement as to the allocation of the contracts is expected. In former times it was the custom to allot one big ship of each year's program to the Royal dockyards at Portsmouth, and Devonport, respectively, but this was impossible in the present instance because the building slips at these yards are not large enough to take vessels of such colossal dimensions as those of the post-war capital ship. Consequently, all four units are to be built by contract, and in view of the uncertain state of the labor market and the fluctuating price of materials it is not improbable that the work will be done on a cost-plus-profit basis.

#### Battle Cruisers with Heavy Armor

Up to the present only the meagerest details of the new ships have been published officially, and the Admiralty shows no inclination to disclose further particulars. But from hints dropped in the House of Commons during the recent debate on the Navy Estimates and from various statements made in well-informed quarters it is possible to visualize the essential features of the design. Although they are officially designated battle cruisers, the new ships will be slower than the *Hood*; but they will have thicker armor and a much more powerful battery. They may therefore be taken as representing a virtual amalgamation of the battleship and battle cruiser types, a course which has been strongly urged by British naval officers with war experience.

The striking lessons of the late war have, indeed, profoundly modified the British estimate of tactical values. Ten years ago there was a veritable craze for speed, and in order to gain an extra knot or two hitting power and protection, but especially the latter, were cheerfully sacrificed. Several of the British battle cruisers with the Grand Fleet carried thinner armor plating than that of the German pre-dreadnoughts, and their sides were penetrable by heavy-caliber shell at almost any effective range. Furthermore, weight had been saved by thinning down the armor on turrets and barbettes, and by fitting horizontal protection that could offer no serious resistance to heavy blows.

#### Ten-Minute Ships

Even before the war the vulnerability of these ships was well known in Germany. Admiral von Tirpitz dubbed the "Invincible" class "Fisher's ten-minute ships," thereby implying that they would succumb to attack by gunfire in ten minutes. Jutland unhappily vindicated the accuracy of this German estimate. The *décuirassement* doctrine, initiated by Lord Fisher, found its most striking expression in the battle cruisers *Renown* and *Repulse*, built during the war. These ships were fitted with narrow belts of 6-inch armor, and when they joined the Grand Fleet at Scapa Flow Admiral Jellicoe, realizing their fatal weakness, refused to incorporate them

in his battle formations until they had been taken back to dockyard and fitted with thicker plating over vital parts. Since the war the *Repulse* has been partly reconstructed, and in place of her original belt now has a deep girdle of 9-inch armor. Also, the anti-torpedo bulge has been broadened and deepened—changes which have increased her fighting efficiency by 50 per cent. Her sister, the *Renown*, will undergo a refit on similar lines when opportunity offers.

#### Improving on the *Hood*

In the *Hood*, which was designed before the Battle of Jutland, but not actually laid down till afterwards, an attempt was made to embody the lessons of that action by increasing the armor belt from 8 to 12 inches and the barbettes from 9 to 12 inches, involving an additional weight of nearly 5,000 tons. But the *Hood*, after all, was a compromise, and has been explicitly repudiated by the Naval Staff as a genuine post-Jutland type. They consider her design to be wasteful in that it allows a battery of only eight big guns on the enormous displacement, at full load, of 44,600 tons, and they are not satisfied with her protection against flat trajectory and high-angle fire. All these faults are to be remedied in the new ships, the plans of which have probably received more attention than was bestowed on those of any previous unit of the Royal Navy. Briefly stated, their salient characteristics are: a numerous battery of 16-inch guns in triple turrets, side armor proof against perforation at long range, and very stout horizontal protection; moderate battle cruiser speed, but a very extensive cruising radius; duplication of controls for every important element of the maneuvering, gunnery, torpedo, and signalling organization. The following data, not being official, must be accepted under reserve, but they are believed to be substantially accurate: Length over all, 850 ft.; extreme breadth, 104½ ft.; mean draft, 29 ft.; normal displacement, 43,500 tons. How many 16-inch guns will be mounted is not definitely known, but alternative arrangements of ten guns in two triple and two double turrets, and twelve guns in four triple turrets, have been suggested. The machinery will be geared turbines supplied by small-tube boilers, the plant developing up to 125,000 shaft horse-power. According to this figure the maximum speed will probably be about 29 knots. The proposal to equip one ship with the electric drive has been rejected, as this method of propulsion is not viewed with favor by British naval engineers. The machinery will account for about 9.5 per cent of the total displacement, as against 13 per cent in the *Hood*. This fact is significant of the diminished value now attached to speed by the controllers of the British Navy. The oil stowage capacity will be sufficient for a run of 10,000 nautical miles at economical speed, enabling the ships to steam from England to Hong Kong without refuelling. No details of the armor system are accessible, but it is known that valuable pointers were obtained from the firing experiments at the ex-German battleship *Baden* last March and from several other tests conducted in the past twelve months.

#### Why the 18-Inch Gun Was Rejected

From the gunnery viewpoint the most interesting feature of the new ships is the introduction of the 16-inch caliber, which is new to the British Navy. Some thirty years ago a 110 ton piece of 16¼-inch caliber was mounted in a few ships, but was eventually discarded on account of its abnormal weight and slow rate of fire. Why the 16-inch gun should have been adopted at this stage is something of a mystery to the uninitiated, considering that the new mark of 15-inch mounted in the *Hood* has proved to be a thoroughly satisfactory weapon. But the explanation is simple enough. The Naval Staff, presided over by the First Sea Lord, Earl Beatty, is said to have been in favor of mounting 18-inch guns in the new

battle cruisers. Guns of this caliber were actually made during the war and displayed magnificent ballistic qualities both on the proving ground and in action against the German positions on the Belgian coast. The monitor *Lord Clive*, armed with a single 18-inch gun, made accurate shooting at 42,000 yards, and on the eve of the armistice this vessel, together with another monitor similarly armed, was preparing to bombard Bruges at a range of 50,000 yards. All who have seen the 18-inch gun at work are in agreement as to its fine properties. Notwithstanding its great weight—160 tons—it can discharge one round per minute, and its accuracy at all ranges is far superior to that of smaller caliber weapons. Had military and technical considerations alone prevailed, there is little doubt that the new British battle cruisers would have been armed with 18-inch batteries. But the Cabinet, according to rumor, opposed such an armament, on the ground that it might be construed as a challenge by other Powers, notably the United States and Japan, and inaugurate a new international competition in “tons and guns”—a development which British statesmen are particularly anxious to avoid. This is probably the first time on record that the design of British fighting ships has been influenced by diplomatic considerations, but, looking at the matter in a broad light, few will question the sagacity of the Cabinet's attitude. Japan, at any rate, is known to have designed an experimental 18-inch gun, if she has not actually built one; and as for the United States, it is all but certain that the later capital ships of the current program would have been re-designed for an 18-inch armament had weapons of this caliber been selected for the British battle cruisers.

But the Naval Staff, having been denied the 18-inch gun, was determined that its new ships should not be inferior to their foreign contemporaries, and therefore resolved to introduce the 16-inch model, which had previously been adopted for the capital ships of the United States and Japan.

#### The New 16-Inch Gun

As shown in Vickers' list, the new gun is 741.25 inches in length, the bore being 720 inches long, and the total weight 117 tons. The armor-piercing projectile weighs 2,240 pounds, and is fired with a muzzle velocity of 2,450 foot-seconds and an energy of 93,230 foot-tons. With an uncapped projectile the penetration of wrought-iron plate at the muzzle, according to the Gavre formula, is 57 inches. The maximum rate of fire is 1.2 rounds per minute. A shorter model of the same gun, 43.65 calibers in length, weighing 107¾ tons, and firing a 2,461-pound shell, is also listed by Vickers. In both cases the weight of the projectile, it will be noted, exceeds that of the American 16-inch shell, though the muzzle velocity is less. As mounted in the new ships the 16-inch gun will be capable of elevation up to 35 degrees, at which angle the extreme range will be over 40,000 yards. Apart from the increased range obtainable, the advantage of giving the main guns a generous angle of elevation is that it enables them to keep bearing on the target even though the ship be listing heavily as the result of damage on or below the waterline.

#### British Adopt 3-Gun Turret

The turrets will be of a new pattern, built up of 15-inch or 16-inch armor on the exposed parts, with a flat roof that will offer no “bite” to descending shell. Each of the three guns in the turret will have independent elevating gear. All the turret machinery will be hydraulic, for although British naval engineers are fully alive to the merits of electricity for this purpose, they still believe in the all-round superiority of the hydraulic system.

The secondary battery will comprise 16 rapid-fire guns of 5.5-inch or 6-inch caliber. Although introduced only six years ago, the 5.5-inch has become popular in the Navy owing to its light weight compared with the

6-inch and its very high rate of fire. The projectile weighs 82 pounds, and is considered sufficiently heavy for the attack of hostile destroyers or submarines. Each of the new ships may carry as many as 12 torpedo tubes, all or nearly all mounted above the waterline. Professional opinion has turned against the submerged tube owing to its repeated failures during the war. Torpedoes fired from these tubes when the ship was traveling at high speed did not run straight, apparently because the sliding bar, or "spoon," failed to protect the torpedo from the lateral pressure of water as it emerged from the tube. Moreover, there were several cases of the bars bending under the strain, and more than one ship had to return to dock-yard to have a buckled torpedo bar withdrawn. For these reasons the modern tendency is to mount torpedo tubes above the waterline, where they occupy much less space and are far simpler to operate.

#### New "Hoods" To Be Built Slowly

According to present plans, the four new battle cruisers are all to be in commission early in 1925. Their keels will be laid during the coming winter, and the building period is to extend over 36 months. Not more than £2,500,000 is to be expended on the work during the current fiscal year, which terminates on March 31. No credence should be attached to recent rumors that the British Admiralty has a further big program of construction up its sleeve. Further British naval policy will, of course, be influenced by the outcome of the Washington Conference, and it is a fact that the people of Britain fervently desire a happy issue both on political and economic grounds. Burdened as they are with a heavy load of war debts and crushing taxation, they are not prepared to sanction any ambitious scheme of naval aggrandisement which cannot be shown to be absolutely vital to the national safety. It is true that the four-ship program, involving a total first cost of about £30,000,000, has been accepted without serious criticism, but this is because the country realizes that unless something is done at once to replace obsolete material the British Navy a few years hence will have declined to third place and the Empire would henceforth be existing on sufferance.

It may be said in conclusion that the new battle cruisers fall considerably below the ideal cherished by British Naval tacticians. Not only has their design, as mentioned above, been influenced by political considerations, but the Admiralty constructors have had to work inside a definite financial limit, which compelled them to keep within relatively modest dimensions. The "ideal capital ship," as defined by Sir George Thurston, Vickers' well-known designer, would be a vessel 932 feet in length, 112 feet broad, drawing 31½ feet of water and displacing 57,000 tons at legend draft. She would have machinery of 200,000 S. H. P. for a speed of 33½ knots, and be armed with a main battery of eight 18-inch 45 caliber guns. Monsters such as this may possibly be afloat in a few years' time, but it is more than doubtful whether the first of them will fly the British flag.—*Scientific American*, December, 1921.

CAPETOWN TO COMMISSION FOR FOREIGN SERVICE.—At the termination of her official trials, for which she is to be commissioned as soon as possible, the new light cruiser *Capetown*, now completing at Pembroke Dockyard, will be completed to full crew from Devonport Dépôt in March for service on the North America and West Indies Station, where she is to relieve the *Cambrian*.—*Naval and Military Record*, 14 December, 1921.

TANKS TO BE CONSTRUCTED AT SINGAPORE.—It is announced by "Modern Transport" that the Wessoe Foundry and Engineering Co., Ltd., Darlington, have recently been awarded by the Admiralty the contract for the supply and erection in Singapore of ten steel oil-fuel tanks, each 116 ft. in diameter, by 45 ft. 6 in. Each tank will be capable of holding about 12,000 tons of oil.—*Naval and Military Record*, 14 December, 1921.

SUCCESS AT WASHINGTON.—Now that Japan has signified her adhesion to the formula of naval tonnage proposed by the United States and accepted by the British Empire, and has further expressed her readiness to join with those Powers and France in a treaty which aims at securing a peaceful settlement of all disputes likely to arise in the Pacific, it may be said that the Washington Conference has achieved an extraordinary measure of success. Many matters of detail remain to be settled, some of which may prove more difficult than is commonly assumed; but in view of the goodwill and forbearance which has been displayed by all the Powers concerned so far as the negotiations have gone, there is every reason to anticipate a complete and satisfactory adjustment of the minor issues still outstanding. The first and most obvious result of the Conference will be the elimination of that dangerous form of international rivalry which finds expression in naval shipbuilding.

A great deal of the credit for having made possible the suspension of competition in armaments belongs to the British Government, which had announced, well in advance of the Conference, its readiness to accept the principle of naval equality with the United States. That, we believe, was the first step which led up to the present arrangements, for it would not have been possible to propose a graduated scale of naval armaments unless the two leading maritime Powers had previously come to an understanding on the subject. Once that had been reached, the rest depended on good statesmanship, of which there has certainly been no lack on the American side. Apart from its material results, the most gratifying feature of the Conference has been the fraternal co-operation between this country and the United States. The American Press generously acknowledges the wholehearted support which the British delegation has rendered to Mr. Hughes throughout the proceedings. There can be no doubt that this demonstration of unity between the two nations which together exercise a dominating influence on the world's affairs deeply impressed the other participants, and was the chief factor in checking any obstructive tactics which may have been contemplated.

With the broad features of the limitation scheme already accepted, it becomes possible to estimate the effect it will have on the navies concerned. We do not hesitate to say that the British Empire is a gainer by the scheme, for it leaves us relatively stronger at sea than we should have been had the various programmes been allowed to mature. The four ships it was proposed to lay down this year would not have sufficed to keep us even at the same level of strength as the United States, and in order to maintain a bare equality in post-Jutland ships we should have been compelled to build eight or twelve further vessels during the next few years. Moreover, any additions to the American programme would have necessitated a corresponding increase to ours. The financial burden entailed by such a policy would have been colossal. It is doubtful, indeed, whether the depleted resources of this country would have been equal to it, for the Dominions could have given us but limited help.

Some may hold that the United States, wealthy as she is, would never have entered into an actual building-slip competition with us, but would have been content with a navy of approximately the same dimensions. That may be so, but there is no proof of it. Thanks to the war and the big-Navy propaganda which was conducted in the United States a few years ago, the American people are more interested in sea power today than at any previous period of their history, and it is quite likely that had no agreement been reached they would have insisted on maintaining the lead in naval strength.

Our sacrifice of the four new battle cruisers—if "sacrifice" be an appropriate term in this connection—has therefore been amply repaid. In relative strength we have gained appreciably. We are left for the time

being with what is unquestionably the finest and most formidable battle fleet in the world. The foreign ships of post-Jutland type whose completion might have rendered it obsolete will not now be built. The *Maryland* and the *Nagato* are the only vessels of this type afloat, and, while their paper value is higher than that of any British battleship, the *Hood* is a sort of counterweight to either. Besides, a main battle fleet comprising ten 15-inch gun ships, with a reserve of eight ships carrying 13.5 in., we retain four battle cruisers which will continue to represent a squadron of unique power and mobility. These ships would have been largely negated by the Japanese Amagi class and the U. S. Constellation class.

But the real merit of the naval agreement is that it does not benefit one Power at the expense of another. America may have forfeited the chance of attaining naval supremacy, which would in any case have been of doubtful value to her; but she has escaped the necessity of spending enormous sums on ships, bases, and fortifications to make her Pacific possessions secure. What is more, she has averted the peril of a war which, as her experts know full well, would have been by far the greatest and most terrible adventure in which she had ever engaged. It would not be easy to exaggerate the difficulties and dangers that would confront the United States, if she found herself in conflict with Japan. All the strategical advantages would rest with the latter, and while the struggle might be decided in the end by economic staying powers, the American people would assuredly have to undergo a bitter ordeal before they prevailed.

Japan is not the least of the beneficiaries under the scheme. By a stroke of the pen she has been freed from the dead weight of an expenditure on armaments which was out of all proportion to her resources. Rightly or wrongly, she deemed it necessary to spend no less than half her income on battleships and battalions, and consequently had little to spare for the other public services, including education. The progress of Japan towards that high standard of civilization to which she aspires was therefore seriously impeded. Popular discontent at the crushing taxation had lately been manifesting itself by symptoms that filled the ruling class with alarm. The communistic creed was making rapid headway among the workers, and the domestic outlook was becoming grave. The root cause of all these troubles was the Government's policy in regard to armaments, which not only devoured huge sums of money, but strengthened the militarist party and encouraged it to persevere with aggressive schemes abroad whilst pursuing a policy of reaction at home. A reduction of armaments on the scale now agreed to will do much to shake the position of the Japanese militarists, and may pave the way for a more liberal régime.

On the other hand, it will leave Japan strategically in a position every whit as favorable as that which she would have occupied had the "eight-eight" building scheme and the army program both come to fruition. This was undoubtedly the conclusion which led so ardent a navalist as Adml. Baron Kato to accept the American proposals with so little demur. Whether the agreement respecting the future attitude of the Powers in China will be as favorably received in Japan remains to be seen. Her vested interests in China are great, and, unless these receive adequate acknowledgment in the four-Power Treaty, it is to be feared that she will prove but a luke-warm adherent to the compact. She may justly lay claim to preferential treatment in China, and will doubtless be found to have received it when the full text of the agreement is made public.—*Naval and Military Record*, 14 December, 1921.

NAVAL ATTACHÉS.—A very much wider scope appears now to be given to the office of Naval Attaché. Not only is the number of British naval

officers so employed higher now than it was before the war, in spite of the fact that Berlin, Vienna, and Petrograd have dropped out of the list of capitals to which Attachés are sent, but in selecting officers for such appointments the Admiralty do not now restrict themselves, as formerly, to those in what used to be known as the executive branch. A few months ago, attention was directed to the appointment of Paymaster Lieutenant-Commander Lloyd Hirst as Assistant Naval Attaché in South America—the first officer of the accountant branch to be chosen for such a post. Since then, as a glance at the new *Navy List* will show, the Admiralty have further widened the field of selection by the appointment of Engineer Commander Harold A. Brown and Constructor A. G. W. Stanton, R. C. N. C., as Assistant Naval Attachés at Washington. Appointments of this kind point to the fact that duty as Naval Attaché is now regarded from a utilitarian standpoint rather than from the social or diplomatic point of view only, and officers are sent who, as students of the technical or administrative progress of Navies are able to keep the Admiralty well informed on such matters.—*Army, Navy, and Air Force Gazette*, 10 December, 1921.

### JAPAN

**THE MITSUBISHI WORKS.**—An attractively printed and illustrated brochure entitled *An Outline of Mitsubishi's Enterprises* has recently been published. The Mitsubishi group numbers among its activities shipowning, shipbuilding, engineering, iron and steel manufacturing, coal mining, marine and fire insurance, banking, estate-owning, etc., etc., and it thus holds a most important position in the commercial life in Japan.

The Mitsubishi Zosen Kaisha (Mitsubishi Shipbuilding Co., Ltd.) has a capital of \$50,000,000 yen, and has become the largest shipbuilding concern in the Far East. The principal undertakings of the company are the building and repairing of warships, passenger and cargo steamers, cross channel ferries, etc.; the manufacture of electrical machinery, engines, boilers, and general machinery; the manufacture of torpedoes, and other implements of war; and iron and steel manufacture. The head office is at Tokio, and the works are situated at Nagasaki, Kobe and Hikoshima, with armament works and steel works at Nagasaki.

The Nagasaki Works comprise dockyards, factories, etc. At Akunoura there are numerous engine shops, including machine, fitting, turbine and electric shops, etc. On the jetty is an electric hammerhead crane with a lifting capacity of 150 tons. The Tategami Shipyard has eight concrete building berths, the largest of which is 767 ft. long and is worked by overhead cranes running on gantries the full length of the berth. Joiners' shops, saw mills, riggers' shops, etc., are also installed. The three graving docks have a length of 423, 371 and 729 ft. respectively, and the patent slip has a length of 228 ft. at the carriages. One of the latest additions to these works is an experimental tank.

At the Kobe Works are foundries, machine, electric, rigging, sail and pattern shops, etc. The three concrete building berths are 510 ft. long, and there are also three smaller berths for submarines, as well as three floating docks. The last-named can lift vessels of 7,000, 12,000 and 16,000 tons respectively.

At the Hikoshima Works are three graving docks, 369, 460 and 264 ft. long respectively, with the necessary machine, blacksmiths', foundry and fitters' shops.

At the Nagasaki Works, 1,300 officials and 17,000 workmen are employed, and the shipbuilding capacity is about 100,000 tons per annum. The Kobe Works have a capacity of 40,000 tons of new shipping annually, and employ 500 officials and 9,500 workmen. At the Hikoshima Works

there are 70 officials and 700 workmen employed.—*The Shipbuilder*, December, 1921.

THE FAR EAST.—A news item that does not appear to have been given the prominence in the American press to which its importance entitles it relates to the recent occupation of Kamchatka by the forces of the government of the maritime province of Siberia. This government was created under Japanese supervision as the result of an insurrection fomented by Japan against the Far Eastern Republic, and its actions are to all intents and purposes the actions of Japan. The important phase of the occupation of Kamchatka is the possession which it gives Japan of Emma harbor at Petropavlosk, lying within 250 miles of the Aleutian Islands, and as a naval base controlling the whole northern Pacific route from America to the Far East.

Emma harbor is the only real harbor in north Pacific waters. It is open at all seasons and is sufficient to accommodate and base the largest fleet. As the Japanese already hold possession of islands directly on the route to the Philippines via Hawaii and Guam, Emma harbor is the only remaining terminal to a Pacific route that would be free from danger of attack by Japanese submarines. In the possession of Japan it effectively covers her northern flank and serves as the base of departure for an eastward advance.—*Army and Navy Journal*, 17 December, 1921.

JAPAN SPONSORS CIVILIAN FLYING INSTRUCTION.—Under regulations of the Japanese War Department, young men between the ages of 17 and 20 years, who are desirous of receiving training with a view to becoming civil aviators, are accepted as pupils by the Chief of the Air Board provided they fulfill certain requirements. The instruction of the air pupils at the Army Flight Schools lasts for eight months.

The number of pupils assigned to take the course each year is fixed by the Chief of the Air Board, and vacancies may be filled by him from among those who took the examination for admission and were not previously admitted.

When air pupils have completed their course of study, the Commandant of the Army Flight School awards them certificates of completion and reports the result of their study to the Chief of the Air Board through the Chief of the Army Technical Department.—*Aviation*, 19 December, 1921.

OSAKA SHOSEN KAISHA.—For the half year ended June 30th, 1921, this company reports gross earnings of ¥30,070,446 and a net profit of ¥5,045,682 as against ¥50,448,571 gross earnings and ¥12,260,464 net profit for the corresponding period of 1920. In their report the directors say that, on account of the world-wide trade depression, the results achieved were exceedingly bad. In almost every trade the showing was unsatisfactory. The company's fleet, including vessels under construction, consists of 190 vessels of 460,091 tons.—*Nautical Gazette*, 10 December, 1921.

## UNITED STATES

DELIVER SEAPLANE CARRIER.—The Todd Shipyard Corporation has turned over to the United States Navy the U. S. S. *Wright* which has been converted into a balloon and seaplane mother ship in the Tietjen and Lang Shipyard, Hoboken. The vessel is named in memory of Wilbur Wright.

The *Wright* was originally built for the transport service and the alterations include space for the stowage of six kite balloons, a plant for generating hydrogen and repair plants for balloons and seaplanes. The vessel will carry spare wings and other parts and will also be equipped with a pigeon coop, aerological laboratory and a complete photographic



laboratory. She will be armed with four five-inch guns and two machine guns.

The *Wright* is 448 feet long, 58 feet beam and 31 feet depth and of 14,240 tons displacement. She will have a cruising speed of 15 knots.—*Aerial Age Weekly*, 26 December, 1921.

TO SALVAGE OBSOLETE WARSHIPS.—Of special interest at this time is a meeting which will be held next Friday at the navy yard, Philadelphia, of the representatives of leading business men, financiers, shipbuilders, steel operators, scrap dealers, chambers of commerce, and editors of trade papers to confer with representatives of the Navy on the subject of scrapping the obsolete vessels of the Navy. These vessels are offered for sale on January 16 and include the battleships *Maine*, *Missouri*, *Wisconsin*, cruisers *Brooklyn*, *Memphis*, and *Columbia*, the monitors *Ozark*, *Puritan*, *Miantonomoh*, and *Tonopah*, and several destroyers and other craft. These vessels are not fit for use as cargo ships, and the naval authorities know of no concern operating in this country with facilities for breaking up big steel-built ships. The present offering, bids for which are invited for January 16, constitutes an unusually large group of vessels to be sold as hulks; and with the Hughes proposals looming large in the horizon, it is thought at the Navy Department that this is a peculiarly suitable occasion to encourage the development of the industry, which has flourished in England for years, for the breaking up of obsolete steel ships. Over there a standard price prevails of about 2½ cents a pound net to the government for old naval vessels, at which figure the navy obtains a fair price and the ship-breaking concerns thrive because of the permanency of the industry. The forthcoming conference at Philadelphia is expected to produce results in the way of bringing about such facilities in this country; and to that end the business men will be shown about the back channel—the cemetery of the Navy—and invited to present a plan of financing and developing a ship-scrapping organization which can extract the useful material from these vessels at a profit to itself and a fair return to the Government. About fifty invitations were issued by Paymaster General Potter to attend this conference.—*Army and Navy Register*, 10 December, 1921.

GUAM AS A NAVAL BASE.—To the Editor of *The Tribune*.—Sir: Will you kindly permit me to point out that the belief expressed by some writers in the great strategic value of Guam rests upon two fundamental errors?

1. One error is the belief that it would be possible to develop Guam into an adequate naval base. The insuperable difficulty in doing this is that Guam is not large enough. Its total area is only 210 square miles. If Guam were dropped bodily into Manila Bay, Chesapeake Bay, Long Island Sound or Puget Sound there would be plenty of water left all around it. If the whole island could be dug out and made into a harbor of quiet water the harbor would not be too large for the uses of a modern fleet in war, because it would have to be able to hold not only the fleet, but supply vessels of all kinds, and be equipped with numerous great repair shops and a number of drydocks. These drydocks would have to accommodate many different kinds of vessels, such as battleships, battle cruisers, submarines, supply ships, etc. One dock, no matter how large, would not be enough, because a single seriously wounded ship would monopolize it for several weeks.

2. The second error is the belief that even if it were possible to develop Guam into an adequate base it could be effective in assisting a fleet setting out from it to recapture the Philippines. Guam is too far away from them. Guam is 1,500 sea miles from Manila by one route and more than 1,700 by another route. Imagine a mined or torpedoed ship having to steam 1,500 sea miles to get into drydock! Realize that our

ships would be exposed to mines and to torpedoes, launched from planes and submarines, just as soon as they reached the vicinity of the Philippines, and in a greater degree when they tried to pass through the straits and bays with which the archipelago is filled. All the routes to Manila would be through waters ideal for the use of mines, submarines and torpedo planes.

Remember that the British Grand Fleet found it impossible to operate against Germany's coast; not because of the German high sea fleet, but because of submarines and mines. Remember, also, that the British fleet had several bases and drydocks, of the best possible kinds, only 300 or 500 miles away, across the comparatively smooth North Sea.

As a base for operations in the Far East the Philippines are incomparably better than Guam. Not only are they five hundred times as large, but they possess scores of fine bays and harbors, especially the Bay of Manila. *If the Philippines were equipped with adequate air forces no enemy could land in them.* In case they were threatened our fleet would find little difficulty in advancing to assist them, because it would be superior to any probable enemy that would try to stop it.

Whether the enemy occupied Guam or not would not make any great difference, because Guam is too small to help an enemy materially—especially an enemy whose home bases and drydocks were not far away.

BRADLEY A. FISKE,

Rear Admiral, U. S. N. (Retired),

Washington, D. C., Dec. 13, 1921.

—*New York Tribune*, 16 December, 1921.

FOUNDERS SUBMARINE RAISED.—The *S-48*, the new submarine which came to grief on her builder's trial run December 7, was raised Tuesday from the bottom of Long Island Sound where she was resting. She was brought up by means of chains slung between two lighters and was taken to the Lake Torpedo Co.'s yard for inspection as to the amount of damage inflicted.

From a naval officer on submarine inspection duty we learn some of the details of the thrilling experiences which the members of the crew underwent when the submarine was sunk. The vessel was in charge of Mr. J. E. Austin, operating manager of the Lake Torpedo Co., and was enroute to New London to make her deep surmergence test, required to determine that she can withstand the submerged sea pressure to which she may be submitted during her lifetime.

"Just outside of the harbor," says this officer, "preparations were made to hold a dive and a short submerged run, after which it was planned to bring her to the surface and proceed on engines to New London, where the deep dive was to have been held.

"When the orders were given to open the various flood valves which permit the water to enter the ballast tanks and submerge the vessel, water rushed into the ballast tanks, and it is thought that one of the small access holes to one of these ballast tanks was left open, or gave way, and permitted the water to enter the hull of the boat proper. The water rushed in through this opening into the engine room at such a high rate of speed that it was impossible to close the flood valves to the affected tank, with the result that in a very short time the engine room and the motor room abaft it were completely flooded with water. The crew of the boat had barely time to close the water-tight door between the engine room and the forward part of the vessel to save themselves, and the after section of the vessel was segregated by closing the engine room water-tight door. The problem then presented to the men on board was that of getting the vessel to the surface. The amount of water in these after compartments represented much more than that which was in the tank

and available for pumping overboard, so that it was immediately realized by those in charge that when all available water was removed the vessel would still be so heavy as to not rise to the surface."

From accounts given by the members of the crew on board the main electrical motors were immediately grounded, all the lights were grounded, and the boat was left in total darkness. Coupled with this, some of the water flooded over the ventilation piping of the engine room into the main storage batteries of the vessel and caused the generation of the deadly chlorine gas. Combatting this gas became a matter of immediate import to save the lives of all hands, and it is reported that at this junction M. A. Fritz, chief electrician's mate, U. S. Navy, who was one of the naval inspectors on board the vessel, took charge of the fight against the chlorine gas and cut the battery hose into short lengths and syphoned the salt water from the battery tank into the after part of the vessel. These heroic measures, assisted by bailing with coffee pots and other small containers, helped to cut down the amount of salt water in the storage batteries and thus reduce the amount of chlorine generated.

While the civilian crew of the vessel, who were totally unfamiliar with such a chlorine problem, turned to with a will under the able direction of Chief Fritz, the operating manager, assisted by Lieutenant Commander W. S. Haas and Lieutenant F. A. Smith, the officers on board, tried out the various means to empty the ballast tanks and full tanks of their contents to give the boat the positive buoyancy to permit her to rise to the surface.

The dummy torpedoes carried in the torpedo tubes were fired over the side with markers attached to tell the world the plight of the vessel. The radio mast was run up to mark the scene of the wreck to any passing vessel. However, after all the water was pumped overboard, it was still observed from the depth gages carried in various parts of the vessel that the bow was still under water. At this point the only means for further lightening the vessel were found to be about five tons of pig lead carried in the torpedo room to cover certain weights which were not actually on board.

This pig lead was, piece by piece, put in the chamber of the sounding machine and dropped through the bottom of the vessel. The reward for this arduous labor was to note the vessel's bow rising inch by inch to the surface until, after being submerged eight hours, just at dusk the depth gages in the boat read "zero."

On opening the torpedo tube the crew were rewarded with noting that the outer door was above water. Mr. Peter Dunne, one of the company's employees, then crawled through the outer door to the upper deck of the vessel. He attached a line to the deck and, returning by the same route, advised his imprisoned mates of the status of things on the upper deck. Three men then went out on the deck, and mattresses, pieces of wood and clothing on board were passed up to the top side and a fire lighted to attract the attention of passing vessels. This was kept up for five hours, when the Standard Oil Co.'s tug No. 28, in command of Captain Eugene Olsen, sighted the fire and, thinking it was a motor boat on fire, came over to investigate.

The tug picked up all the members of the crew, who one by one, came through the torpedo tube, and took them to New York, where they received treatment at the naval hospital. Chief Electrician's Mate Fritz, to whom in a great degree the crew owe their lives, was found to be suffering from a very severe case of chlorine-gas poisoning, as was also Lieutenant F. A. Smith, U. S. Navy. The other members of the crew suffered to a certain extent from exposure.

The naval personnel on board were officers and men who were slated for duty in the vessel after she went into commission, consisting of

Lieutenant Commander W. S. Haas, commanding; Lieutenant F. A. Smith, executive; Chief Torpedoman J. F. Cullinane, and Chief Electrician's Mate M. A. Fritz.

The *S-48* lay in about 70 feet of water some four miles outside of the harbor of Bridgeport, with about 20 feet of her bow extending out of water at an angle of about 20 degrees.

The *S-48* is about 1,000 tons displacement, propelled on the surface by two Busch-Sulzer Bros. Diesel engines; she is 240 feet long and of double hull construction and had on her the latest equipment of current submarine design.

The submarine *S-48* was raised and towed to the harbor of Bridgeport, Conn., on December 20, where the Lake Torpedo Boat Company is proceeding with the work of placing her in operating condition.

The *S-48* was under water for practically 13 days. The final stages of the salvaging operations consisted in pumping the water from the motor room, and then, after taking the strain on the stern of the vessel between the two 250-ton barges, *Monarch* and *Century*, pulling the stern out of the mud and holding it in flotation while the vessel was towed into the shoals in the harbor of Bridgeport. After this the vessel was pumped dry with comparative ease, and the work of cleaning up the interior and overhauling the machinery as required is going forward. It will probably take about two months to put the vessel back in good running condition.—*Army and Navy Register*, 24 December, 1921.

MEN AND SHIPS.—In view of all that has been heard about the supremacy of the human factor in war it is rather surprising that the American proposals for naval limitations take no cognisance of personnel. Apparently it is intended that the Powers affected by the agreement shall decide for themselves how many officers and seamen they are to keep in service, and this seems the wisest arrangement to make. Any attempt to ration the naval man-power of each nation would scarcely be practicable, for the conditions vary in each case. Japan, for instance, maintains a personnel abnormally large in proportion to her establishment of ships, especially in the commissioned branches. The reasons for this are explained by the Japan "Year Book" as follows:—"Differing from the system followed in England, the Japanese Admiralty organizes its fighting staff by holding a full complement of active officers in readiness to meet all emergencies. This is the reason why our navy is apparently overstaffed as compared with that of England. The English fleet, which totals about 2,330,000 tons, has a staff of 3,111 officers, from midshipmen to flag officers. The corresponding figures for our fleet are 650,000 tons and 2,190 officers. Reduced to a per ton rate, the English fleet has 1.35 officers against 3.42 for Japan." At the present moment both the British and American navies are undermanned. In our case the deficiency is due to lack of funds. We could get plenty of men if money were available for their training and keep. But in the case of America the difficulty is to get the men. A year ago the U. S. Navy was declared by several of its admirals to be on the verge of disaster through shortage of trained men.

We have heard it suggested that one reason why America has proposed to scrap 15 of her uncompleted capital ships is that she knows it would be impossible to man them even if they were completed. This seems to us a far-fetched theory, though there may be grain of truth in it. What effect the adoption of the American disarmament scheme will have on our own personnel remains to be seen. Recruiting for certain branches has already been suspended, but similar action has been taken on previous occasions, and the Admiralty deny that the present step is connected with negotiations at Washington. Still, it is obvious that if practically all the reserve ships are to be done away with, and no new capital ships are to be

built for ten years, the Navy's personnel will have to be reduced below the present figure. The scrapping of valuable ships is serious enough, but the loss of highly-trained ranks and ratings would be infinitely more so. A capital ship may be put together in two years, but it takes at least thrice that length of time to turn out a capable man-of-war's-man.—*Naval and Military Record*, 30 November, 1921.

**PAY PROPOSALS BASED ON LENGTH OF SERVICE.**—The report that the Wadsworth Joint Congressional committee will make to Congress on the readjustment of pay in the Services is forecast in a memorandum prepared by Representative John C. McKenzie, of Illinois, which is now being studied in the War, Navy and Treasury Departments. Boards of officers from the Army, Navy, Marine Corps, Coast Guard, Public Health Service and Coast and Geodetic Survey are carefully analyzing Mr. McKenzie's proposals with a view to reporting the result to the Joint Congressional committee.

It is a comprehensive plan which would completely readjust the pay of the Services. The basic principle is that officers' pay should depend more on length of service than on time in their grades. It also introduces the principle of making an allowance for extra pay to officers who have dependents. The heat and light commutation allowances are simplified and given elasticity by allowing the President to adjust them to the cost of living. The boards which have been appointed to make a study of the McKenzie plan are holding night sessions.

#### Believed Bill will Pass

It is understood that Mr. McKenzie has taken the proposition up with the leaders of the House, and has canvassed the general legislative situation. He is convinced that it will pass the House, where it has been anticipated all along the most opposition would be encountered in securing any legislation for the continuation of the present rate of pay. The merit of the proposition to the economists is that it will not increase, and may decrease, the appropriations for pay of the Services. In some quarters, it is insisted that a saving of three million dollars in the pay of the Services will result from the adoption of the McKenzie plan.

In outlining his plan to the Departments, Mr. McKenzie submitted a memorandum, which we quote in part:

"The pay schedule for officers of the Services should be based on the length of time officers have served rather than exactly on the grades in which they happen to be serving; and some distinction should be made in amount of allowances granted to officers with dependents and those without. I have come to the conclusion that a permanent pay schedule should be arranged on such a basis as to introduce a sort of sliding scale so that the amount received by an officer might be changed from time to time by Presidential order to meet the changing conditions in cost of living.

#### Elastic Schedule Proposed

"I believe there should be established for the officers a pay schedule which should be fixed in amount based on length of service, and entirely independent of family or of dependents; that to this base pay should be added certain allowances in the form of commutation of rations and commutation of quarters, which allowances should, to some extent, be based on dependents and should be subject to some degree of elasticity. I would divide the officers of each Service into, say, six groups, along such lines as follows:

"Those serving in the first four years of their commissioned service, in first group; those serving from beginning of fifth year, to end of eleventh year of their commissioned service, in second group; those serving begin-

ning of twelfth to end of seventeenth years, third group; eighteenth to end of twenty-third year, fourth group; twenty-fourth to the end of thirtieth year, fifth group; and those with more than thirty years' service in sixth group. I have made six divisions to correspond with the six grades from second lieutenant to colonel, inclusive.

"Since an officer's value increases with his training, his experience, and professional development, I would start the young officer just commissioned with say \$1,000 a year as base pay, gradually increasing that to \$6,000 a year when he has completed thirty years' commissioned service.

#### Dependents Provided For

"Under the present law when an officer changes stations transportation is furnished his dependents, and to an officer at sea, or in the field, commutation of quarters is furnished his dependents. I would extend this principle slightly, to every officer an allowance of one ration, to an officer with one or two dependents, an allowance of two rations; to an officer with three or more dependents, an allowance of three rations; to an officer not furnished public quarters I would give commutation, based both on length of his service and on his dependents. I would divide the officers so as to include in one group the first three classes noted above (those of less than 18 years' commissioned service) and those of the last three classes in the second group (those of more than 17 years' commissioned service). To the first group not occupying public quarters, without dependents, I would give commutation of rent for one person for one month; to those with one or two dependents, I would give commutation of quarters for two persons for one month; to an officer with three or more dependents, I would give commutation of quarters for three persons for one month. To the officers in the second group who have no dependents, I would give commutation of quarters for two persons for one month; to those with one or two dependents commutation for three persons for one month; to those with three or more dependents commutation for four persons for one month.

"To meet changes in cost of living, I would fix the limit within which the President might exercise his discretion in fixing amount of commuted value of rations (say not less than twenty-five cents nor more than one dollar) and amount of commutation of quarters for one person for one month (say not less than \$15 nor more than \$30). To an officer who enters or has entered the Service in a grade above that of second lieutenant (or corresponding grades in other Service), I would give for purpose of pay only constructive service equal in amount to that specified in the Army Reorganization act for promotion in the Veterinary Corps; that is three years for first lieutenant, seven to captains, fourteen to majors, twenty to lieutenant colonels, and twenty-six years to colonels.

#### Service in War and to Date

"In order to reconcile the differences in length of service of those officers who entered the Army during the war I would favor giving to all persons who served as commissioned officers of any of these services at any time between April 6, 1917, and November 11, 1918, whose original entry into the Regular Service (whether Army, Navy, or Marine Corps, etc.) was subsequent to April 6, 1917, credit for continuous service from April 6, 1917, to the date of the passage of this act, except as specifically stated in the act. I would allow no service to be computed for determining an officer's pay except commissioned service rendered under a Federal commission; in other words, service as a candidate for a training camp, as a federally recognized National Guard officer, as a cadet at either the Military or the Naval Academy, or any similar service, would not be

computed in determining an officer's pay. To those officers whose promotion is limited by law to any grade below that of colonel (or the corresponding grade in the other services), I would limit their maximum pay to that determined by the limitation in promotion. For example, the pay of the officers of the Medical Administration Corps of the Army whose promotion is limited to that of captain, would be limited to that of officers serving between the beginning of the twelfth and the end of the seventeenth year.

"To officers who fail in examination for promotion to next grade, and to those passed over for promotion by a selecting board, and those reduced by reason of sentence of a court-martial, I would deny an increase of pay during their suspended promotion. I would abolish all existing laws which authorize longevity pay and commutation of quarters, heat and light, and all laws which authorize an increase of pay for foreign service and for sea duty. To officers actually on duty in the field or dependents at home, I would allow commutation of quarters for the dependents, not to exceed three in number, but not for the officer himself. I would limit the dependents to a wife, a boy under age of twenty-one, unmarried daughters of any age, and invalid son of any age, an officer's mother or father, or invalid brother or sister dependent upon him for support."—*Army and Navy Journal*, 10 December, 1921.

CHANGES IN PROSPECT FOR NAVAL RESERVE.—Secretary Denby has before him the report and recommendations submitted by the board of naval officers, headed by Rear Admiral Thomas Washington, chief of the bureau of navigation, appointed some weeks ago to consider the changes which should be made in the laws governing the naval reserve force. While no announcement will be made of the contents of this report until it has received the sanction of Secretary Denby, it may be surmised that it will contain a plan for the rehabilitation of the citizen reserve along the lines of the National Guard and with a system of payment for services rendered in drill periods, which will be practically identical with the Army reorganization act. Such a plan will doubtless meet the desire of Mr. Denby, who was quoted in these columns some weeks ago as favoring the reestablishment of the naval militia as a naval reserve organization, with the joint support of the states and of the federal government. No retainer will be paid to the members of this force, but they will receive the pay of their grade when on active duty or in training. It is probable that three classes will be recommended, the first being the fleet reserve, composed of ex-Navy people, and the members of the present class 2, or sea-going officers and men; the second being the citizen reserve patterned after the National Guard, as described, and the third the volunteer reserve, which will likely remain much as it is now constituted, with no requirements for drills and no pay or retainer whatsoever. As for the fleet reserve, which is of greatest interest to regulars, it is a foregone conclusion that the strong objections raised by Chairman Wadsworth and other members during the pay hearings last week will be met and the generous retainer incomes now being paid will be substantially reduced, both for officers and men. Recommendations may be expected to eliminate altogether in future the 16-year class of enlisted reservists, who now draw in the neighborhood of \$60 a month retainer, and a reduction in the retainer which will be drawn by future members of the 20-year class. Recognition will doubtless be asked of the fact, well known in naval circles, that greater efforts are needful to keep a naval reserve intact than would be necessary for an Army reserve, as the organization units are much further apart in the interior, and a greater need exists for drills in the duties of a man-o'-war'sman, which must be conducted at a naval station. As men scatter to the inland states after completing their active naval service, entering civil occupations, special

facilities must be provided for them to drill under naval conditions, even though the nearest naval station may be hundreds of miles distant. Another recommendation which may be predicted is that officers in the new plan will receive commissions in the reserve which will continue in force until revoked by proper authority instead of the present requirement of re-enrollment of all officers every four years. The four-year period of enrollment greatly increases the paper and administrative work without corresponding advantage to either the government or to the individual. A reserve officer, under the new plan, would hold his commission at the pleasure of the Department, or, in plainer language, so long as he met the requirements and his services in his grade may be needed. A limitation will probably be placed upon the citizen reserve, perhaps in the neighborhood of 60,000, with possibilities of rapid expansion in event of threatened hostilities. During the recent session of the representatives of the reserve officers' association in Washington frequent conferences were held between the reservists and the members of the Navy board, and the salient features of the board's recommendations were fully discussed, and it is presumed that the plan of reorganization has been accepted as satisfactory by the reserve officers. During their stay in Washington they came to realize the necessity of curtailing governmental expenditures and they recognize now what many naval reservists did not recognize before—the futility of any attempt to obtain continued appropriations for the payment of large retainers to members of the reserve merely to hold themselves in readiness for naval duties in time of emergency.—*Army and Navy Register*, 10 December, 1921.

ANALYSIS OF MCKENZIE PAY PLAN.—The serious consideration which is being given to a substitute for the service pay provisions of the act of 1920 render important at this point in the discussion of service compensation a further analysis of the plan suggested by Representative McKenzie, vice-chairman of the special committee. During the hearings on the readjustment of service pay at the session of December 2 Mr. McKenzie, in presenting his plan to General Pershing, called attention to the fact that the special committee then sitting had several courses open to it. In the first place, he said, the committee could recommend a continuance for one or two or three years of the present temporary increase, or it could take no action whatever, dodge the responsibility, and let the law expire by limitation on the thirtieth of June next, thereby letting the pay revert to the 1908 schedule. But, he said, knowing the chairman of the committee as he did and the other members of the committee, he thought he was safe in saying that the committee would not be content to follow the line of least resistance, but that it would endeavor to solve some of these vexatious problems that have been confronting Congress and the services for many years. He felt that the problem concerning pay was one that required very careful study and a complete readjustment of the pay of the services along sound lines that would be in the interest of both the government and the services. In the statement which he then presented to General Pershing he enunciated three general principles as the foundation upon which to build the readjusted pay schedule: First, to make length of service the controlling factor in determining the base pay of officers; second, to provide for a sliding scale by the introduction of elements which will increase or decrease the total compensation of officers as the cost of living increases or decreases; third, partially to base the allowances of officers on the number of dependents that an officer is called upon to support.

Under the present pay schedule the base pay of officers is determined both by the grade in which the officer is serving and his length of service. Mr. McKenzie's proposition would abandon the principle of basing an officer's pay on his grade. The question as to whether or not this is sound in principle immediately arises. Grade and rank in an Army existed



before pay. Rank was originally instituted for purposes entirely separate from the matter of pay. It was instituted for purposes of discipline, precedence, prestige and as a function of command. Some time or other in the history of armies an officer's pay was made dependent upon the grade which he held. Undoubtedly there was a good reason for doing this at the time it was done. In our Army a few years ago an officer's responsibility was determined almost entirely by his grade. Such is not the case at the present time. An officer's responsibility at the present time is determined by his assignment, and his assignment is determined primarily by his qualifications, secondarily by the grade in which he is serving. Of course, in some cases, as, for instance, in a tactical organization such as a regiment, battalion or company, an officer's grade is the determining factor in his assignment, but in the great majority of cases his qualifications are the determining factor, and his grade has little to do with it except as grade tends to determine qualifications. For example, an officer on duty in the War Department is assigned to duty in accordance with his qualifications and his assignment is rarely changed when he is promoted to a new grade. His responsibilities being fixed by his assignment are the same after promotion as they were before promotion. This can be very definitely illustrated by referring to officers on duty as instructors at the various service schools. For example, take a department at West Point. Members of the class of 1916 in the grade of major, drawing the pay of majors with one fogle, are serving alongside of and performing the identical duties with members of the class of 1917 who are serving in the grade of captain and drawing the pay of that grade without any fogies. The responsibilities of these officers are identical and their qualifications are practically the same in spite of the fact that they are widely separated in rank. The question naturally arises should their pay be the same?

The idea that basing pay upon length of service puts officers of Army or Navy in a class of pensioners or time servers, as has been suggested, is not only absurd, but is absolutely inconsistent with the facts. Under existing law an officer who commits a crime is court-martialed and dismissed; if he is physically disabled he is removed from the active list, and if he is otherwise unfit to perform the duties of an officer he is placed in Class B and thereby removed from the active list. Existing law requires that the qualifications of every officer in the Army be inquired into every year. There is no class of persons in this country whose mental, moral, professional and physical qualifications are inquired into as carefully, as rigidly and as often as are those of officers of the Army. Any officer who gets by all these annual tests and becomes merely a time-server in the government service does so because the War Department is derelict in its duty.

Providing a sliding scale by means of which an officer's compensation may be increased or decreased according to the cost of living is completely new in our system of pay for the services, but everyone seems to feel it is eminently fair and based on sound economical grounds. It brings out very clearly the point that, generally speaking, an officer is not paid for his services, but is paid on the principle of maintaining him in a position where he can enjoy the comforts of a decent living without being harassed by financial worries, no matter what the cost of living may be. In other words, it brings out clearly the principle on which the compensation of officers of Army and Navy is based.

The commissioned officers of the Army constitute an institution maintained by the government in time of peace and trained in their profession for the purpose of responding to the federal needs in time of an emergency, whether that emergency be in the nature of a strike in Colorado or West Virginia, an earthquake and fire in San Francisco, a flood in the Mississippi Valley, an insurrection in the Philippines, a Boxer uprising

in China, a threatened revolution in Cuba, an expedition into Mexico or a world war. It is for the purpose of meeting these emergencies that the government maintains the commissioned officers of the Army. The service that these officers render in time of peace is never evaluated in terms of dollars; in fact, their service is never evaluated in such terms even in times of emergency. In this respect Army officers are on an entirely different basis from persons engaged in practically every other profession or occupation. In civil life a man's services can be evaluated from time to time in terms of dollars and cents. For example, a day laborer's services can be evaluated every night. The president of a corporation's services can be evaluated from time to time, possibly once a year. The government, on the other hand, has no means by which the service of officers of the Army or Navy can be evaluated in terms of dollars and cents. The officers of the regular service constitute an insurance that the government is maintaining for the purpose of meeting the federal needs in time of emergencies. The theory on which the government pays these officers is that they shall have enough to maintain them so they can prepare themselves to meet these emergencies. Every boy who goes into the Army certainly understands that the character of the service in the Army deprives him of any opportunity to engage in any sort of business or professional activity for the purpose of accumulating money. He does not necessarily make a financial sacrifice when he goes into the Army, but he does understand thoroughly that when he starts his career as an officer of the Army he gives up the opportunity to accumulate anything more in the way of money than comes to him through his government salary. The very life which he must lead makes it absolutely impossible for him to engage in any kind of money-making business, and the government expects and demands that he shall not divert his time, his energy or his ability from the military profession into other channels. Therefore, the theory on which the officers are paid is not that they are performing a service which is being evaluated and for which they are being paid in accordance with that evaluation, but it is on the theory of maintaining them in time of normal conditions so that they will be ready instantly to respond to the federal requirements in time of an emergency, no matter what those requirements may be. It is for this reason that the compensation allowed officers should have in it this element of a sliding scale, which makes it possible to adjust the compensation on the basis of the cost of living.

It is because of this same principle, namely, that the government is maintaining the officers of the service for possible future emergencies, which makes it necessary to provide a greater allowance for officers with dependents than for those without dependents. The fact that dependents have a direct bearing on the manner in which officers perform their service has been recognized by the government for many years. It was because of this fact that extra pay for foreign service and for sea duty was authorized. At the time of this authorization the government realized that the officer in the Philippines or at sea had to maintain two establishments; one for himself and one for his family at home, and it was partially to meet the requirements of maintaining these two establishments that the 10 per cent increase was authorized. The Army, when stationed on the border, where there were no quarters for families, realized for many years that something should have been done in the way of commutation so as to provide a place to live for the family of an officer on the border. When the World War broke out and all the people of the country became involved in it the fact that dependents had such a decided and controlling influence on the manner in which persons engaged in the military service perform their duties prompted Congress early in the war to pass laws providing for family allowances and for commutation of quarters to officers in the field with dependents at home. Later, in 1920, the fact that the cost of transportation of an officer's dependents was a matter of having a very im-

portant bearing upon his services (made it necessary generally for the officer to borrow money to move his family every time he changed station). prompted Congress to provide in the act of May 18, 1920, for their transportation at government expense. If the fact of dependents is not to be taken into consideration in fixing an officer's compensation, then, under the theory on which officers are paid, that is, that they are being maintained by the government for use in emergencies, the pay schedule of 1908, as Mr. McKenzie has stated, is sufficient for the officer alone. Under the McKenzie plan the base pay of an officer, his own subsistence allowance and his own allowance for commutation of quarters are entirely independent of and have no connection with dependents. It is only when the officer has persons dependent upon him for support that the plan increases the allowances to meet the requirements of those dependents. In other words, if dependents are not to be taken into consideration, the base pay, the subsistence allowance for one person and the commutation allowance for one person and the commutation of quarters for one person are, it is claimed, sufficient to meet all requirements.

Practically all the testimony given before the special committee (nearly 500 pages of fine print) shows that a compensation greater than that authorized in the act of May 11, 1908, is necessary because under that pay schedule an officer cannot support a family. There was no evidence brought forward to show that the 1903 pay schedule was insufficient to meet the requirements of a single person without any dependents. In view of this situation, it is necessary to make the compensation of officers who have dependents greater than the compensation of those without dependents, or else it is necessary to make the compensation of those without dependents too much for their needs in order to make the pay of those with dependents enough for their needs. No other conclusion can be drawn.—*Army and Navy Register*, 24 December, 1921.

SHIPS OFFICERS ACCEPTING POSITIONS AS ABLE SEAMEN.—Officers created by the war in the American merchant marine are rapidly being forced by lack of employment to return to the fo'c's'le as stewards or even able seamen. This is the observation of Dr. George Sidney Webster, Secretary of The American Seamen's Friend Society, who says:

"It is surprising to note at the Home of The American Seamen's Friend Society the increasing number of men having served as officers during the war who are now obliged to return to the engine room or steward's duties—in many instances even the duties of an able seaman. Many of these men were graduates of navigation schools and received thorough training for their duties as officers. They composed some of the men who in recent years would reserve their room by wireless at the Society's quarters before their arrival in the Port. Today they are sleeping in the dormitories with other seamen.

"Most of these men are either American born or naturalized and it is a pity that the training which they have received as officers cannot be used to its full range. Of course some of the men who have received this training have already left the sea, but most of them have remained with the job that is regarded by them as a life work. To be living again in the fo'c's'le after a period on the quarter deck is something of a test to any sailor. However, it is a matter of pride to us to observe the faithfulness of these men to the sea."—*Nautical Gazette*, 24 December, 1921.

STANDING OF U. S. PORTS.—Much has been published at various ports relative to the importance and standing of their particular ports, and figures have been printed to substantiate their various claims. One port will dwell on total tonnages of vessels entered and cleared regardless of whether they are in ballast, partly or fully laden or merely touching at an intermediate port; another will produce figures of actual long tons discharged or laden (which is mere guesswork, as such figures are not obtainable from official

customs records), while another will use the official customs statistics of values of imports and exports.

The last mentioned method is the more nearly correct way to compare the various ports, namely, by values of imports and exports, particularly by imports, says the *Commercial News* of San Francisco. Judged in this manner, the relative standing of the principal ports of this country is as follows:

Port and Rank	Total Imports and Exports
1. New York.....	\$6,176,494,431
2. New Orleans.....	986,453,444
3. Philadelphia.....	724,412,853
4. Galveston.....	679,982,468
5. Boston.....	584,554,985
6. Detroit.....	463,570,906
7. Baltimore.....	451,380,973
8. San Francisco.....	437,756,058
9. Norfolk.....	331,729,622
10. Seattle.....	326,958,481
11. Ogdensburg.....	288,109,225
12. Buffalo.....	259,365,795
13. Savannah.....	256,283,030
14. St. Albans.....	154,648,958
15. Tampa.....	146,583,788

—*Nautical Gazette*, 27 December, 1921

**AQUITANIA'S INCREASED SPEED.**—Since the Cunard liner *Aquitania* has been converted into an oil burner, her speed has been considerably increased. During the last portion of her eastbound voyage from New York which ended in Southampton on November 21, she attained a speed of 26.66 knots. With the exception of the *Mauretania*, no ship afloat has ever equaled this speed. Much interest has been aroused as to the possibility of new records being made by the *Mauretania* and the *Berengaria* which are being converted from coal to oil burners.—*Nautical Gazette*, 24 December, 1921.

**BOARD OFFERS SHIPS SUITABLE FOR DIESEL ENGINES.**—According to an announcement by Admiral Benson, the Shipping Board has decided to offer for sale 20 of its ships to such purchasers as will agree to install Diesel engines in these vessels. Ten of these will be of the Great Lakes type and two each of the 7,200 deadweight ton type, 8,400-ton, 9,400-ton, 10,000-ton and 12,000-ton types.

"We have long recognized the prime necessity of developing Diesel engine driven tonnage if this country is to take its rightful place as a maritime nation," Admiral Benson said. "At present day costs this installation in a 10,000-ton vessel will amount to around \$500,000. Sales of Diesel tonnage have been made abroad as low as \$60 a deadweight ton, but the going rate today is probably nearer \$80.

"The Board unanimously believes that in this action it is carrying out three important provisions of the Merchant Marine Act—first, placing of its tonnage in private hands; second, providing the most modern type of vessel for service under the American flag, and, third, giving work to American shipyards at a time when their business is at very low ebb."—*Nautical Gazette*, 10 December, 1921.

**BOARD'S MONTHLY LOSSES REDUCED.**—Losses of the Emergency Fleet Corporation totaled \$3,954,000 in October as against \$5,000,000 in August and more than \$6,000,000 last June, when the new Shipping Board took office.

The payroll as of November 18 was given as \$10,993,000 compared with \$15,861,000 on June 15—these figures being on an annual basis—a decrease of \$4,868,000 in five months. There are now 1,300 ships tied up, as compared with 956 in June according to the report.—*Nautical Gazette*, 10 December, 1921.

**BRITISH AND U. S. MERCHANT STRENGTH.**—According to Chairman Lasker of the Shipping Board, considering only passenger ships and combined passenger and cargo ships of 8,000 tons and over which represent the very cream of the world's merchant marine convertible for naval purposes, Great Britain possesses 234 ships of this type already completed, and the United States possesses 54 ships, or a ratio of 4.3 to 1 in favor of Great Britain. If vessels now actually building in both countries of this type be taken into consideration, the ratio in favor of Great Britain is 5 to 1.

When speed is considered, and speed is essential for naval purposes, the ratio is even more startlingly in favor of Great Britain; as of vessels of 22 knots and over she possesses 5, the United States possesses only 1, or a ratio of 5 to 1; in all vessels of 12 knots and over, which is the minimum speed useful for naval operations, she possesses 234, and the United States possesses only 53, or a ratio of 4.4 to 1 in favor of Great Britain.—*Nautical Gazette*, 17 December, 1921.

**ISHERWOOD SYSTEM STANDS UP UNDER SEVERE TEST.**—In tow of two wrecking steamers the oil carrier *F. D. Asche*, owned by the Standard Oil Company, arrived at New York on December 1 after having been towed from the Bahamas without any bottom. The vessel met disaster in the cyclonic storm of late October after leaving New York for Texas City. She is a steel vessel of 12,000 tons deadweight built by the Newport News Shipbuilding Company in 1918, and was swept out of her course and piled up on the treacherous reefs of the Bahamas. She climbed over one reef only to lodge on another, where she remained fast, her forehold deck level with the sea in  $5\frac{1}{2}$  fathoms of water and her entire bottom practically ripped off.

Owing to the fact that the vessel is built on the Isherwood System of longitudinal construction of ships, the hull withstood the strain of the perilous position in which she lay on the rocks. Captain McKenzie and his crew remained on board the steamer and were able to use the donkey boiler and donkey engine to maintain their radio communication and also to provide their needs on board.

The wrecking steamers *I. J. Merritt* and *Willard*, of the Merritt-Chapman Wrecking Company, were sent to the assistance of the *F. D. Asche*. It was found, by the divers, that the hull of the ship, with the exception of the bottom, had remained intact and that she was susceptible, therefore, to being raised by means of compressed air tanks. After being raised and still kept afloat by the emergency compressed air tanks, the two wrecking steamers took the vessel in tow and brought her safely to New York.

The salvaging of the *F. D. Asche* is practically a duplication of the salvaging of the steamer *Curaca*, which was damaged in Halifax Harbor in the great dynamite explosion during the war. The *Curaca's* superstructure was blown away entirely and she was buckled to an alarming extent. But her hull held together, she having been built on the Longitudinal System, perfected by Sir Joseph Isherwood, and she was finally raised and towed to New York, where she was repaired at the Robins Drydock of the Todd Shipyards Corporation, the same yard that will now repair the *F. D. Asche*.—*Nautical Gazette*, 10 December, 1921.

**BATTLE CRUISERS COULD BE MADE INTO FASTEST LINERS.**—President Joseph W. Powell of the Emergency Fleet Corporation states that it is entirely feasible to convert the six American battle cruisers scheduled to be scrapped under Secretary Hughes' naval disarmament program into fast passenger liners. Each is 874 feet long, 101 feet beam, has a mean draft of 31 feet and a displacement of 43,500 tons. They include the *Constellation* and *Ranger*, at the Newport News Dry Dock and Shipbuilding Company's plant; the *Constitution* and the *United States*, which were to have been built at the Philadelphia Navy Yard; the *Lexington*, at the

Quincy yard of the Bethlehem Company, and the *Saratoga*, at the Camden plant of the New York Shipbuilding Corporation. The *Lexington* has been constructed up to the third deck, or just above the water line.

The cruisers were originally designed to make a speed of 34 knots and with their great boiler capacity, they could attain an economical cruising speed of 26 knots, Mr. Powell said, crossing the Atlantic in five days. The ships, after conversion into liners, might readily accommodate 1,000 first class, 1,000 second class and 2,000 third class passengers.

Mr. Powell does not believe it would be advisable to convert more than three of the vessels into passenger liners because that number would be adequate for the service. No estimate was made by him as to the amount of money necessary for changing the cruisers into passenger vessels, but he said it would be less than the cost of building new liners.

In local shipping circles not much stock is taken in this suggestion of Mr. Powell's. In an interview Mr. J. W. Stewart, American representative of Sir Joseph Isherwood, inventor of the Isherwood system of longitudinal framing which was adopted for the battle cruisers, pointed out some of the defects of the Powell plan.

"There are so many practical difficulties to be overcome and the expense of conversion would be so great that the vessels would prove a liability and not an asset," said Mr. Stewart. "As to the cost for making the necessary changes, I would say off-hand that they would be the equivalent of one-half the cost of building the ship. When completed they would be probably the most expensively built and most costly operated commercial passenger ships in the world.

The battle cruisers are too delicately constructed for the rough handling and continuous service to which they would be subjected as passenger ships. Placed on the seventeen trips a year schedule followed by the fast foreign liners, the constant drive of the engines, coupled with the grinding against piers and other rough usage, would result in time and money being lost for repairs.

"There is the further consideration that the boilers, being of navy design, occupy more space and require more expert handling than is considered economical on passenger ships. In general the design of the under deck compartments, together with the large amount of room taken up by the running gear, means a sacrifice of deadweight space. The tendency of passenger ship building today is all in favor of the vessel which can carry cargo as well as passengers. If it is true that substantial profits can only be shown by ships of this type, then the converted battle cruisers would obviously be unsuited to the conditions of competition that now prevail."—*Nautical Gazette*, 10 December, 1921.

NOVEMBER'S VESSEL OUTPUT IN DETAIL.—The Bureau of Navigation, Department of Commerce, reports 79 sailing, steam gas, and unrigged vessels of 61,599 gross tons built in the United States and officially numbered during the month of November, 1921, as follows:

	Atlantic and Gulf		Pacific		Great Lakes		Western River		Total	
	No.	Gross	No.	Gross	No.	Gross	No.	Gross	No.	Gross
<b>WOOD</b>										
Sailing.....	3	87	.....	.....	.....	.....	.....	.....	3	87
Steam.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gas.....	50	1,334	2	66	.....	.....	4	61	56	1,461
Unrigged.....	3	1,230	2	156	1	325	.....	.....	6	1,711
Total.....	56	2,651	4	222	1	325	4	61	65	3,259
<b>METAL</b>										
Sailing.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Steam.....	8	46,292	1	9,838	.....	.....	.....	.....	9	56,130
Gas.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Unrigged.....	3	2,108	.....	.....	2	102	.....	.....	5	2,210
Total.....	11	48,400	1	9,838	2	102	.....	.....	14	58,340

Sailing.....	3	87	.....	.....	.....	.....	.....	3	87
Steam.....	8	46,292	1	9,838	.....	.....	.....	9	56,130
Gas.....	50	1,334	2	66	.....	.....	4	61	56
Unrigged.....	6	3,338	2	156	3	427	.....	11	3,921
Grand Total....	67	51,051	5	10,060	3	427	4	61	79
									61,599

The above total includes 32 rigged vessels of 880 gross tons and 5 unrigged vessels of 1,614 gross tons, total 37 vessels of 2,494 gross tons built in years previous to 1921. Of the above total 1 vessel of 14,187 gross tons was built for the United States Shipping Board. This was the passenger and cargo carrier *Bay State*. The next largest vessel completed was the tanker *Wm. Rockefeller* of 14,054 gross tons constructed for the Standard Oil Company.

The following vessel, which is not included in the above statement, was built in this country for foreign owners during the month of November, 1921:

Rig.	Name of vessel	Gross	Owner	Flag
St.s	<i>Victolite</i>	10,396	Imperial Oil Co., Ltd.	Canadian

—*Nautical Gazette*, 24 December, 1921.

IDLE TONNAGE ABROAD.—According to latest foreign advices, ocean-going vessels of the following tonnage were laid up in ports of the countries hereinafter named:

Country	Gross Tons
Denmark.....	330,000
Sweden.....	366,000
Norway.....	851,635
Spain.....	452,000
Italy.....	790,000
Japan.....	250,000*
Great Britain.....	5,380,000*

\* Deadweight.

—*Nautical Gazette*, 10 December, 1921.

## AERONAUTICS

TRIALS OF HELIUM FILLED AIRSHIP C-7.—The U. S. Navy's non-rigid airship C-7 is the first lighter-than-air craft in the world to make a flight inflated with helium gas.

The airship left the Naval Air Station at Hampton Roads, Virginia, at 6:37 A. M. arriving at Anacostia at 10:20 A. M. after going over the city. On her return trip she left the Air Station, Anacostia, at 12:03 P. M. again circling the city, and reaching Hampton Roads at 4:30 P. M. The flight was made without mishap of any kind.

Prior to this trip a thoroughly satisfactory flight of about forty-five minutes was made, followed by a second flight of about fifteen minutes duration. The performance of the airship on both these flights was excellent.

The crew for the initial flight was as follows: Lieut. Comdr. Zachary Lansdowne, U. S. N., commanding officer; Lieut. Comdr. R. F. Wood, altitude pilot; Lieut. A. T. Sewell, direction pilot; Chief Machinist Mate Ferris, engineer.

During the three flights of the airship C-7, no helium whatsoever was lost in operation by valving.

### Advantages of Helium

The great advantage of helium gas over hydrogen is that it is not liable to explosions due to static or electric connections, or from ignition due to sparks from the exhausts of the engines. Probably the greatest disadvantage in the use of helium is its cost of production, its availability and its buoyancy, as compared to that of hydrogen. Hydrogen with 100 per cent purity and under standard atmospheric conditions has a buoyance of 70 lb. per 1,000 cu. ft. of air displaced, while helium under similar conditions has 64.4 lb. lift. When helium has lost purity and consequently lift on account of diffusion with air it can be put through a repurification process and used again.

The Navy maintains a helium plant at Fort Worth, Tex., where helium is extracted from natural gas by compressor systems. It is required that a plant of this character be located where there is an abundance of gas and also an abundance of water for cooling the numerous compressors. The natural gas, after passing through this plant, becoming a purer illuminating gas than before when it is then returned to the gas company for commercial use. The natural gas is first passed through lime which removes carbon dioxide; it is then liquified, leaving nitrogen and helium gases which are drawn off and further compressed thereby liquifying the nitrogen and leaving the helium which is drawn off and compressed into cylinders and placed in storage for shipment.

### Naval Airship Types

The Navy has been operating single-engined airships mainly for training purposes: the envelopes for these small airships have capacities ranging from 84,000 to 95,000 cu. ft. with dimensions roughly of 162 ft. in length and maximum diameter of 33 ft., the height of the ships being 48 ft. These small types carry a crew of three men, machine guns or bombs and sufficient gasoline at cruising speed of 35 m.p.h. to carry Class B ships a distance of 927 miles, class E ships 672 miles and class F ships 1,227 miles.

The Class C ships are twin engined and especially reliable for patrol and convoy work. Their dimensions are, length, 192 ft.; maximum diameter of envelope, 41 ft. 9 in.; maximum height, 60 ft.; maximum width, 53 ft. 7 in. The envelope has a designed volume of 181,000 cu. ft. Their fixed weight ready to fly is 7,940 lb., leaving the balance for disposable weights, consisting of crew, gasoline, oil, navigating equipment, radio, food, drinking water, ballast, bombs, guns, etc. The 181,000 cu. ft. capacity gives a gross lift for pure helium of 11,656 lb., making 3,716 lb. of lift available for the above mentioned disposable weights as against 4,760 lb. with a hydrogen gas purity of 98.6 per cent.

Class C airships have two engines capable of developing 125 horsepower at full speed giving the ship a speed of 55 m.p.h.; at half power the ship consumes 134 lb. of fuel per hour. At cruising speed of about 45 m.p.h. this ship has a cruising range of 2,180 miles. They are designed with sufficient ballonet capacity to reach an altitude of 8,600 ft.

Naval airship operations up to the present time have been mainly convoy, patrol, and photographic flights; their primary military value has been in antisubmarine warfare. It is expected that with the advent of rigid airships into the Navy this field of operations will be greatly broadened in extensive scouting and reconnaissance activities. It is probable also that airships may prove their usefulness in high altitude bombing and spotting work. Due to an airship's ability to hover over one spot they are extremely well fitted for the work of locating floating or surface mines and destroying them.

### Naval Value of Airships

The airship's greatest value to the Allies during the past war was in convoy work. It was particularly noticeable that a submarine would not



attack a convoy that was escorted by airships. The value depended not so much on their ability to detect a submarine previous to its attack on the convoy as on the certainty of the airship locating the submarine after a torpedo attack, and radioing its position to surface craft which would result in the destruction of the submarine by depth charges from either the airship or the surface escort.

An advantage of airships over other types of aircraft is their ability to fly safely in fogs, rain, or at night. In fact, the airship is infinitely more easy to handle at night or in a fog than on the average day, because of their great sensitiveness to the stability of the atmosphere.

Communications between airship and shore stations is maintained by homing pigeons and radio. The radio compass is used to aid navigation in that an airship can locate itself by radio compass bearings taken aboard the ship, or by getting bearings from radio compass stations.

Type C airships require both altitude and directional pilots. The directional pilot is placed in the front cockpit and operates the steering wheel, while the altitude pilots sit in the second cockpit in the fuselage and operate the gas and air valves and engine throttles. The mechanic and radio operator occupy the rear cockpit. On long voyages there would be three pilots, one mechanic and one radio operator, and all unnecessary equipment for that particular flight would be sacrificed for ballast. The ballast may be surplus gasoline or water. When water or gasoline is not discharged for ballast, sand is used. Gasoline is only used for ballast in cases of extreme emergency.—*Aviation*, 17 December, 1921.

THE C-7 TESTS.—Aeronautical experts agree that the three performances of the Airship C-7 with helium gas were excellent in every particular. The later part of the Hampton Roads-Washington flight was made in a snow storm. Summed up, it can be said use of helium as a gas for the inflation of airships has been demonstrated beyond a doubt. Helium, with the exception of the fact that it is a slightly heavier gas, is superior in every other respect to hydrogen. In addition to the non-inflammable and absolutely inert character of helium it involves no fire risk whatsoever, the use of the gas is advantageous from the point of view of the operator as it does not expand and contract nearly as rapidly as hydrogen, a characteristic which makes for economical operation. The diffusion of helium is much less than hydrogen and especially through rubberized fabrics. During the three flights of the Airship C-7, no helium whatsoever was lost in operation by valving.—*Aerial Age Weekly*, 2 January, 1922.

ROMA CHRISTENED.—The 400-foot army airship *Roma* fought her way for five hours and a half against a head wind from Langley Field to Washington December 21 to be named and put in commission officially by Miss Fonrose Wainwright, daughter of the Assistant Secretary of War, who broke a bottle of liquid air on the prow of the dirigible.

Secretary Weeks, Secretary Denby and Senator Rolandi-Ricci, the Italian Ambassador, who participated in the ceremonies, waited for three hours in the chilling wind which blew from the northwest, for the ship to arrive. They were to have taken a flight in her over the city and to Baltimore with other invited guests, but the wind was rising steadily, and Major General Patrick, Chief of the Army Air Service, ordered the *Roma* back to her hangar at Langley Field as soon as she could be refueled.

The great dolphin-like craft arrived at Bolling Field at noon and departed at 2:30, scurrying home with the wind behind her, in two hours and forty minutes.

A crowd of guests and officers of the two air services awaited the arrival of the army's new semi-rigid, the largest lighter-than-air ship in this country, at Bolling Field from 9 o'clock, impatiently stamping their feet and trudging back and forth in an effort to keep warm. Aeroplanes left the field from time to time to search out the great ship, which was con-

tinually reported by radio as approaching from the southeast, but did not appear. Finally she was reported as over Alexandria, making slow progress against a stiff wind, with three of her motors frozen.

Suddenly in the southwest there appeared a great, dull-gray shape, scarcely distinguishable against the slate-colored sky. It was the *Roma*—a massive, fat dirigible, moving a little toward the east, slowly and majestically lifting her nose over the encircling hills. Gradually her bulk loomed up, and she swung toward the west, heading directly for the field, with her motors roaring deafeningly. Approaching quite low, she seemed barely to miss the trees and hangars as she pushed against the wind and finally, reaching the center of the field, put her nose down and slowly settled.

A door in the V-shaped keel, near the bow flew open and a great coil of rope dropped to the "handling" crew below. All hands took hold and slowly the great craft came to earth.

The wind, sweeping from the north and west, swung the great ship back and forth as the men strained at the rope, while stay wires with cables attached were dropped out of ports along the keel to other men who stood by to steady her. Leveling off, but under the blast of her propellers, she settled on her "bumpers" and was landed, but she never stayed still a minute, swaying back and forth and carrying the men clinging to the ropes with her.

Then followed the naming by Miss Wainwright, who stood on a step-ladder under the great curving bows as she broke the bottle of liquid air, which flew into a bluish-gray cloud of vapor as the glass crashed. The old ensign was then replaced by a new one presented by the Italians and hoisted high on the stern over her curious box-like rudder.

Speaking for Italy, where the ship was designed and built, Ambassador Rolandi-Ricca expressed his pleasure that America should have bought her, and Secretary Weeks, in accepting the airship for the War Department, said that the pleasure and opportunity were rather his, that the army should be so fortunate in securing a ship developed by the skill of Italian craftsmen.

Major J. G. Thornell and his staff of pilots and navigators were also thanked personally by Secretary Weeks for their successful trip, despite their handicap of an adverse wind and disabled motors.

After the naming the color presentation took place, Assistant Secretary Wainwright replying to Lieut. Gen. Giuseppe Vaccari, who spoke feelingly of the cordial relations between Italy and America as he presented the new American ensign for the *Roma*.

General Patrick then ordered the field cleared and the ship gassed and rebalanced for homeward flight. As the motors were tuned up the handling crew eased up on the hauling cable and the big ship rose slowly on an even keel.

As soon as she was clear of the field the "let go" signal was given and the cables were hauled up. She slowly forged ahead into the wind, turned to the southeast as she reached the edge of the field. At a height of a few hundred feet the engines were speeded up, and, assisted by the wind, she began her homeward trip at a high rate of speed, disappearing over the hills to the south.—*Aerial Age Weekly*, 2 January, 1922.

GERMANS TO BUILD ZEPPELIN FOR U. S.—Authorization by the Allied Council of Ambassadors for the construction by Germany of a Zeppelin of the L-70 type for the United States was regarded in official circles here as a distinct triumph for American diplomacy.

By virtue of that authorization Germany is permitted to go behind the terms of the protocol signed in Paris last June, which limited the size of airships she might build to 30,000 cubic meters capacity. The airship which Germany will build for the United States is to be of 70,000 cubic meters capacity.

The opposition of the European Governments was overcome by repeated representations by Ambassador Herrick that this country would not use the new airship for military purposes and that America was entitled to compensation in kind for the Zeppelin awarded this Government and later destroyed by Germany.

Under the decision of the Council of Ambassadors Germany will construct a Zeppelin of the L-70 type at the Friedrichshafen hangar, the only one in Germany large enough to permit the building of an airship of that size, and then will tear down the hangar and disperse the mechanics brought together to fabricate the air monster. The completed airship will be delivered to the United States in Germany without the expenditure of a single penny by this Government, it was stated, and then will be flown across the Atlantic by a crew of Navy Department aeronauts. Construction of the airship will be under the direction of a staff of American navy experts.

The German L-70 class of airship measured 743 feet in length, 48 feet longer than the British ZR-2, but having the standard German diameter of 78.4 feet. Their total useful load was more than 88,000 pounds, equivalent to 59 per cent of the total weight of these ships. The ships carried a crew of thirty men each. They were driven by seven Maybach engines of 290 horse power each, arranged in six power cars suspended below the belly of the ship, two being placed in the after car, giving a total horse power of 2,030, and developing a speed of over 80 miles an hour.

Announcement that the Government had obtained permission to construct a rigid airship in Germany was followed by the disclosure that two German aircraft engineers visited this country several months ago to study possibilities of a fast Zeppelin service between Germany, New York and Chicago.

The engineers were said to represent the Zeppelin Airship Building Company of Friedrichshafen and gave their names as Harry Vissering and E. A. Lehman. They were in frequent conference with Weather Bureau officials. It is learned that they discussed plans for a passenger and mail carrying fleet of Zeppelins to ply between Germany and America.—*Aerial Age Weekly*, 26 December, 1921.

**FORTHCOMING AIR CONFERENCE IN ENGLAND.**—The success which attended the first Air Conference which was held in London last year has led to the decision to hold a second Conference at the Guildhall in February next, under the auspices of the Air Ministry. At the last Conference service questions occupied a good deal of attention, but it has been decided that the February gathering will be concerned mainly with the development of commercial aerial transport. All aspects of this question will be discussed, and it is an advantage that Lord Weir has agreed to preside over the technical sessions. Invitations to the Conference are being issued to all those interested in the development of air transport, and arrangements are being made for demonstrations by aircraft and for a visit to the Croydon aerodrome for an inspection of as many types of machines as can be got together for exhibition purposes.—*The Engineer*, 9 December, 1921.

**NAVAL AVIATION PROGRESS.**—The report of Admiral Moffatt, Chief of the Bureau of Aeronautics of the Navy, shows commendable progress for the past year in this branch of the nation's defenses. Perhaps the most outstanding fact in the report is the statement that naval and marine aircraft flew, during the fiscal year, a total of 2,511,055 miles. The notable flights of the year were those of the Atlantic and Pacific fleet air forces to the Panama Canal and return, the F-5L flying boats from Coco Solo, Canal Zone, to Cartagena, Colombia, and the Marine Corps' flight from Washington, D. C., to Santo Domingo City and return.

The question of developing a means for launching planes from battle-ships has apparently been successfully solved, and it will now be possible to provide all ships of the fleet with fighting planes as an answer to the menace of bombing aircraft.

The helium plant at Fort Worth, Texas, has been placed on a production basis, and recently we referred to the success of the flight of the dirigible C-7, inflated with this gas.

Progress has been made in the photographic department, and during the year a photographic map of the Mississippi Delta was prepared for the Coast and Geodetic Survey and a map of Guantanamo Bay for the Hydrographic Office.

Excellent progress has also been made in the communication by wireless between aircraft and surface vessels.—*Aerial Age Weekly*, 26 December, 1921.

ANTI-AIR-CRAFT TARGET PRACTICE NEAR SAN PEDRO.—Navy officers at San Pedro are attaching much significance to the arrival of Capt. H. V. Butler, commander of air squadrons, Pacific, and his senior aide, Lieut. Comdr. P. N. L. Bellinger, in command of a squadron of six F-5-L seaplanes. The tender *Aroostook* accompanied the planes on their trip from San Diego.

Fleet gunnery officers and the air squadron commanders are working on plans for joint practice of the battleship gunners and the planes, to be held next month. The plans include the towing by the planes of kite targets above the battleships at sea. Anti-aircraft gunners will attempt to hit the targets as they are being towed overhead at a speed of 60 miles an hour, it is said. This, however, is only one of the features of the plans now being worked out. Aerial photography, a branch of work which the Navy has been developing rapidly within the past few months, will play an important part in the maneuvers.

The program, officers say, is one of the most important ever worked out by the Navy in peace times, and emphasizes the new importance attached by naval authorities to the efficacy of planes in warfare.

Navy officers say that if the experiments prove successful it is probable that all future anti-aircraft gunnery practice aboard the ships on both the Atlantic and Pacific will be carried out with the aid of planes and towing targets.—*Aerial Age Weekly*, 12 December, 1921.

ADMIRAL SIMS ON AVIATION.—*The following remarks are taken from the Waterbury Republican of November 28 and report a talk given in Waterbury before the Second Congregational Church Forum.*

That the battleship was becoming obsolete on account of the airplane, that the airplane carrier was becoming the backbone of the navy, and that scrapping of the battleships built and planned, as proposed by the disarmament conference, would not affect the defenses of this country at all, were some of the startling statements made by Rear-Admiral W. S. Sims at the Second Congregational Church Forum last night.

The Admiral referred indirectly to the controversy caused by recent utterances when he said that he proposed to speak on the question of battleships versus airplanes, armaments, etc., "So you see," he said, "they are explosive subjects, and allow all possible chances for 'indiscretions.'"

"It has been said in the past that the battleship was the backbone of the fleet," he said, "but I believe it is no more. The battleship has no defense against an airplane but small anti-aircraft guns. At the western front it was considered that one hit in 1,000 was a good average, with massed batteries for miles firing at a plane, and plenty of observation to determine the range. The best experts now agree that the results of anti-aircraft fire from a ship are negligible.

"The command of the air means the command of the surface, whether it be sea or land. The experiment of sinking the *Ostfriesland* by airplane

bombs proves that if our coast is protected by airplanes no ships can reach our shores or land troops."

The great need now is the construction of airplane carriers, he said. The latest model had an absolutely bare deck, he said, the funnels being on the sides of the ship. The deck was sufficiently wide and long to provide ample landing space. It had special elevators which carried the planes below decks. The wings of the planes could be folded up so that a large number of planes could be carried on several decks. An airplane carrier had nothing to fear from a battleship or battle-cruiser, he said, as it had a speed of 35 knots—more than any battleship or cruiser—and could always keep out of the latter's range, while the airplanes it carried could destroy the battleships.

"There are those of us who believe," he said, "that the battleship is gone and that scrapping them doesn't cut any ice whatever. We need not worry, either, about destroying the battle-cruisers now building, as they are as helpless as the battleships against airplanes."

Airplanes could be built far more rapidly and far more cheaply than ships, he said. If we spent millions on battleships and battle cruisers, and another nation spent only half as much on airplanes, he said he would have no doubt of the result.

Numerous questions were asked at the conclusion of the address. One was:

"Will the battleship become obsolete because of airplanes?"

"Yes," Admiral Sims answered.—*Aviation*, 5 December, 1921.

SPAIN TO ARGENTINA AIR LINE PROJECTED.—The Spanish Parliament is practically certain to sanction very soon the granting of a subsidy to an air company operating passenger and mail Zeppelins between Cadiz and Buenos Aires, making the trip between the two cities in ninety hours, according to an announcement by Dr. Hugo Eckner, manager of the Zeppelin works in Friedrichshafen, who has just returned to that city after a tour of South America, during which he studied conditions as applying to an air service.

The enterprise is purely Spanish, but the organization and management will be German.

Dr. Eckner declared that war experiences were such as to enable his company to guarantee the smooth operation of airships of 45,000 cubic feet in size at a rate of speed of seventy-two miles an hour while carrying between thirty and forty passengers and 300,000 letters.

The idea of the Cadiz-Buenos Aires service originated in Spain, he said, the Spaniards being anxious to establish a quick and direct connection with Spain's one-time trans-Atlantic children. Spanish negotiations with the Zeppelin management led to the organization of a commission, which has already provided 50,000,000 pesetas (about \$10,000,000) of the necessary 80,000,000 pesetas (about \$16,000,000), the Spanish Government guaranteeing the interest on this sum.

Speaking before the Argentine Aero Club and the German Club in Buenos Aires, Dr. Eckner emphasized the point that danger from thunderstorms and lightning did not exist for airships, since they were able to dodge tempests. He declared that excellent wind and weather conditions greatly favored the route proposed, which is 6,000 miles long.

The return journey from Buenos Aires to Cadiz will require a hundred hours, owing to the northeast winds that will be encountered.

Dr. Eckner said there were favorable terrain conditions at both ends of the route, particularly in Spain, which will facilitate hangar building. He expects that the entire capital stock of the company will be earned within two years.

It is proposed that the service will be inaugurated with three airships which will cost 36,000,000 pesetas (about \$7,200,000), and hangars, gas

factories and wireless installations, costing 40,000,000 pesetas (about \$8,000,000), while unforeseen expenses are calculated at 4,000,000 pesetas (about \$800,000).

The expense in connection with each trip will be about 42,000 pesetas (about \$8,400), and it is estimated the receipts will be about 900,000 pesetas (about \$180,000) based on carrying sixty passengers at 5,000 pesetas (about \$1,000) each, and 300,000 letters at 2 pesetas (about 40 cents) each.—*Aerial Age Weekly*, 12 December, 1921.

**INSTRUMENT GUIDES PLANES IN FOG.**—Fog is the airman's most dangerous foe, says the *London Times*. The pilot flying in cloud or fog, when he can see neither land nor sky, has no actual consciousness of direction, nor is he able to gauge the poise of his machine. True, he has a compass on board, but the lateral movement and the banking, the changes from climb to descent and vice versa, are inimical to the accurate reading of a compass. The compass card, continually disturbed by these movements, swings backward and forward, with no consideration for the magnetic north or anything else. Sooner or later the pilot is being carried by the aeroplane he knows not where. This fact has never been better illustrated than when recently a flight of machines set out from Shotwick for Dublin, a distance of only 120 miles. Heavy fog and cloud were met. One of the airmen came down off the Scilly Isles. The remainder were never found.

A device to keep the pilot constantly informed in cloud and fog of the actual behavior of his machine has just been perfected. It is called the Reid control indicator. It analyses, by means of a series of small electric lights, every tendency and movement of the aeroplane to which it is attached. It tells the pilot the air speed of his machine, its rate of turn when turning, and whether the machine is correctly banked for its rate of turn, and also direction of sideslip. It demonstrates, moreover, the movement necessary to enable the pilot to regain lost equilibrium and maintain a straight course.

The instrument weighs rather less than four pounds. It is divided into three parts, an upper row of lamps controlled by a mercury device, a lower row controlled by a gyroscope, and an air speed indicator. If the airplane is turning the lamps in the lower row light up, beginning from the center and working outward, and so indicating the direction of the turn. If the machine is sideslipping lighting is produced on the same principle in the upper row. The port or left hand lamps are red, the starboard or right are green. The center lamp in both rows is white. If the two white lights remain constant the machine is on a straight course.

The air speed indicator is set in the center of the instrument and between the rows of lamps. From it the pilot can tell whether he is climbing or descending, according to whether his speed decreases or increases.

The rotation of the gyroscope is effected by an air stream created by the flight of the aeroplane, impinging on the gyro-wheel, in which slots are cut. Under this air pressure the wheel spins at a rate of 6,000 revolutions a minute. The wheel seeks to maintain itself on a constant axis; in other words, gyroscopic action holds it in one vertical plane, and if the aeroplane turns out of that plane to right or left the wheel fights to maintain its position and automatically closes a series of electrical switches on one side or the other and the corresponding lamps in the bottom row on the indicator are lit, as explained above. The number so lit corresponds with the amount of the aeroplane's turning movement.

A mercury bubble device controls the lamps in the upper row, illuminating or extinguishing them according to the movements of the aeroplane out of or into the horizontal plane.

It is claimed that with the Reid control indicator there is no evolution that cannot be carried out by an airman in fog and cloud, and that it makes

point to point flying entirely simple in thick weather.—*Aerial Age Weekly*, 26 December, 1921.

# ENGINEERING

NOTE ON THE FLOW OF AIR AND STEAM IN NOZZLES.—It is now generally recognized that steam when expanded rapidly, as in turbine nozzles, becomes supersaturated provided that the initial superheat is not so high that the steam remains superheated throughout the expansion. Whether any condensation takes place before the nozzle throat is not so definitely known, but some evidence on this point is afforded by the following note on discharge coefficients.

If the theory of supersaturation be correct, the expansion of steam through a nozzle is so rapid that condensation cannot take place down to a pressure below the critical pressure, so that down to the throat the steam expands as a perfect gas. The law of expansion is then:

$$p(V-b)^{\gamma} = \text{constant} \dots \dots \dots (1)$$

$$\gamma = 1.3$$

$$p = \text{absolute pressure}$$

$$V = \text{specific volume}$$

$$b = \text{co-volume, taken as the specific volume of water at 32 deg. F.}$$

Where

The co-volume  $b$  is only 1 per cent. of the specific volume  $V$  at pressure  $p = 300$  lb. per square inch, and neglecting this the maximum theoretical discharge of steam through a nozzle may be shown to be

$$q_{\text{max.}} = 0.3155 a_t \sqrt{\frac{p_1}{V_1}} \text{ lb. per sec.} \dots \dots \dots (2)$$

Where

$$q_{\text{max.}} = \text{maximum theoretical discharge, lbs. per sec.}$$

$$a_t = \text{nozzle throat area, sq. in.}$$

$$p_1 = \text{initial pressure, lbs. per sq. in.}$$

$$V_1 = \text{initial volume, cub. ft. per lb.}$$

The effect of the small term  $b$  neglected here is only 0.274 per cent. of the discharge at a pressure  $p_1 = 300$  lb. per square inch absolute. The value of  $V_1$  to be inserted in equation (2) is in each case the specific volume of the steam at inlet, whether superheated or wet.

For saturated steam, equation (2) may be written in the convenient form:

$$Q_{\text{max.}} = M_1 a_t p_1 \text{ lbs. per hr.} \dots \dots \dots (3)$$

Where

$$Q_{\text{max.}} = \text{maximum theoretical discharge, lbs. per hr.}$$

$$M_1 = \text{a constant depending upon } p_1 \text{ and upon the index in the adiabatic equation, which is here taken as 1.3, the value for dry steam.}$$

Rateau (Recherches experimentales sur l'ecoulement de la vapeur d'eau) measured the discharge of saturated steam through convergent nozzles, and found the empirical equation:

$$Q_{\text{max.}} = 366 (15.26 - 0.96 \log p_1) a_t p_1 \text{ gms. per hr.} \dots \dots \dots (4)$$

Where

$$a_t = \text{sq. cms.}$$

$$p_1 = \text{kgs. per sq. cm.}$$

In English units this becomes:

$$Q_{\text{max.}} = 3.456 (17.05 - \log p_1) a_t p_1 \text{ lbs. per hr.} \dots \dots \dots (5)$$

$$= M_1 a_t p_1 \dots \dots \dots (6)$$

Where

$$\begin{aligned} a_1 &= \text{sq. in.} \\ p_1 &= \text{lbs. per sq. in.} \\ M_1 &= \text{a constant depending upon } p_1 \end{aligned}$$

Table I shows values of  $M_1$  for  $\gamma = 1.3$  (the index for dry steam) and  $\gamma = 1.135$  (the index for saturated steam), and of  $M_2$ , for various values of  $p_1$ .

If the limit of the supersaturation condition is such that no condensation occurs before the throat, the ratio  $\frac{M_2}{M_1(\text{for } \gamma=1.3)}$  is the coefficient of

discharge  $C_d$ , for saturated steam in Rateau's convergent nozzles, and this should then be of the same order in this case as for any perfect gas, such as air or highly superheated steam, through similar nozzles.

Table II shows the comparison of the coefficient

$$\frac{M_1}{M_1(\text{for } \gamma=1.3)}$$

with

1. The coefficient of discharge of air through a convergent nozzle from the experiments of T. B. Morley. (Proc. I.M.E., January, 1916.)

2. The coefficient of discharge of highly superheated steam through a convergent nozzle from the experiments of A. L. Mellanby and W. Kerr. (Trans. Inst. Engineers and Shipbuilders in Scotland, December, 1920.)

It is thus seen that the coefficient of discharge for saturated steam is, according to Rateau's tests, slightly less than that for air and superheated steam, which are about the same. On the other hand, Rateau's nozzles were not all so well shaped as those tested by Mellanby and Morley, so that the evidence, although not quite conclusive, is that there is little or no condensation in the expansion of saturated steam in a nozzle down to the critical pressure ratio. It would be an interesting investigation to determine the coefficients of discharge for steam initially wet, saturated and superheated, and for air, through the same nozzle, and thus determine whether there is any condensation before the throat with wet or saturated steam. So far as the above evidence goes, there is no such condensation, and saturated steam acts down to the throat as a perfect gas with an adiabatic index of 1.3.—Gerald Stoney, D. Sc., F. R. S., and Norman Elce, B.Sc. Tech., *Engineering*, 2 December, 1921.

TABLE I

$p_1$ .....	300	250	200	150	100	50	14.689	10	5	1
$M_1 \left\{ \begin{array}{l} \gamma=1.3 \\ \gamma=1.35 \end{array} \right.$	52.12	52.39	52.73	53.16	53.83	55.02	57.25	57.93	59.46	62.34
	49.64	49.91	50.22	50.63	51.23	52.41	54.54	55.22	56.64	59.33
$M_2$ .....	50.37	50.65	50.98	51.42	52.02	53.06	54.90	55.49	56.52	58.93

TABLE II

Medium	Reference	Initial pressure, Pounds per Square Inch Absolute						
		150	100	75	50	25	10	1
Saturated steam..	Rateau. $C_d$	0.967	0.966	0.965	0.964	0.962	0.958	0.945
Steam at 250 deg. F. superheat.....	Mellanby ..... $C_d$			0.975				
Air.....	Morley. $C_d$			0.97	0.97	0.97		



**BERGIN COAL TREATING PROCESS.**—In certain inner circles of the Continental and British coal industry, much has been heard of late of a remarkable scientific discovery, namely the Bergin process for treating coal. Its inventor is Dr. Friedrich Bergius, a German chemist. According to the *London Times*, the new method consists in subjecting coal to enormous pressures ranging between 100 and 200 atmospheres and in adding hydrogen. In the final result motor fuels, lubricating oils, lamp oil, paraffin wax and other valuable products are obtained. The process has been successfully tried on a large scale at a plant erected at Rheinau. As crude petroleum can be treated by the Bergin process as well as coal, the Royal Dutch and Shell Group have become interested in a company formed to develop and exploit it outside of Germany.

Another interesting process for treating coal is the one devised by a Dr. L. Steinschneider, who is a citizen of Czecho-Slovakia. At his plant at Koenigsfeld, he first slowly distils coal until it has yielded a large percentage of liquid. This liquid is then treated in such a way as to obtain a high percentage of products, including motor fuel. Dr. Steinschneider makes use of a retort still, which does away with high temperatures and smelly products.—*Nautical Gazette*, 17 December, 1921.

**BENZINE FROM COAL GAS.**—A benzine-stripping plant has given very satisfactory results in Wittenberg on the Elbe. New municipal gas works, only of a capacity of 6,000,000 cub. m. of gas per year, were opened in summer, 1920; they had been built up by the Berlin Anhaltische-Maschinenbau A.G., at a cost of 85,000 marks, and the addition of the benzine plant raised the cost to 110,000 marks. By April, 1921, when the works had been in operation for seven and half months, 18, 595 kg. of benzine had been gained according to the manager's report in the *Journal für Gas und Wasser*, page 643, which worked out at 14 grammes of benzine per cubic metre of gas treated. There were no complaints about the gas, and financially the stripping was a decided success, owing largely to the demand for motor fuel.—*Engineering*, 16 December, 1921.

**MOTOR ARRANGEMENTS FOR ELECTRIC SHIP DRIVES.**—The electrically-driven ship appears to be establishing a place for itself, particularly in America, while in the case of the San Benito an important example has recently been completed at Belfast by Messrs. Workman, Clark. In these circumstances the electrical features of such ships are probably worth more attention from electrical engineers in general than they have yet received. A ship may be propelled by means of a squirrel cage motor, an induction motor with a wound secondary, or a synchronous motor. Something may be said for each of these various methods, and the finally best arrangement for any particular type of service is hardly yet established. To confine consideration of these three types of motor only is, of course, to neglect direct-current, which can be, and has been, used. For turbine drives, however, which have so far been adopted for the more important installations, alternating current offers advantages, and for the moment attention may be confined to it. Of the three United States electric battleships which are in service the *New Mexico* has motors with a double squirrel-cage rotor winding, the *Tennessee* has motors with a form-wound rotor, with external starting and manœuvring resistances, and the *Maryland* has motors with combined squirrel-cage and form-wound rotors. The fitting of various arrangements to these important ships is obviously a wise policy, and experience gained with them should assist in determining the best all-round system for battleship work.

An interesting consideration of the qualifications of the various forms of motor for ship propulsion generally is contained in a paper read by

Mr. W. E. Thau before the Society of Naval Architects and Marine Engineers at the New York meeting the week before last. In addition to the alternating-current arrangements we have considered, Mr. Thau also put forward an arrangement with induction motors having wound secondaries worked in conjunction with a system of power-factor correction. It is not clear if this system has ever been employed, but assuming one is prepared to accept the extra moving machinery involved in the phase advancer, which is not a complicated feature in itself, then the system has the advantage of the unity power-factor of the synchronous motor coupled with the simplicity of and the torque characteristics of the wound secondary induction motor. At the same time synchronous operation is not demanded. The straightforward squirrel cage and wound secondary arrangements have the advantage of simplicity and ease of handling. The torque characteristics of the wound rotor are, however, the better of the two, and the chief claims of the simple squirrel cage is that it is robust and inexpensive. By incorporating a double secondary winding as in the case of the *New Mexico* the torque characteristics are improved.

Direct current in its convenience of control has considerable advantage for ship driving, but difficulties are met at the generating end with a turbine drive. When, however, the generator is driven by a Diesel engine the advantages of direct current are leading to its adoption. The Diesel electric ship is at present the subject of a good deal of attention and a number are being built. It is interesting to note that Mr. Thau claims the Diesel electric drive to be the cheapest of all. As compared with the direct Diesel drive the engines do not require to be fitted for reversing. Mr. Thau's main argument in this connection appears to turn, however, on the fact that the relatively small Diesel engines and generators fitted to electric ships can be manufactured on a production basis and more or less bought out of stock, while the direct-drive Diesel will have to be built for its job. There is possibly something in this, but the development of the direct-drive Diesel will also ultimately lead to standard and cheaper types. Some real data on the subject would be of interest. Mr. Thau would appear to be in favour of the Diesel-electric ship generally, and he claims it requires less *personelle* to drive it than a direct-connected Diesel equipment.—*Engineering*, 2 December, 1921.

REMARKABLE RESULTS WITH TURBINE BLADES OF STAINLESS STEEL.\*—Stainless steel, which is an alloy containing from 12 per cent to 14 per cent of chromium, was discovered at the Brown-Firth Research Laboratories, Sheffield, by Harry Brearley, in 1912, and in a report on its properties, written in October of that year, Mr. Brearley suggested its use for the blading of steam turbines.

Several years elapsed before this suggestion was given a practical test. This delay is not surprising, in view of the unsatisfactory results obtained with other materials for which great things have been predicted. It was in 1916 that F. Samuelson, of the British Thompson Company, Rugby, determined to make the trial and, with the consent of one of his clients, used five different kinds of material for the blading of one wheel of a steam turbine. The materials selected were phosphor-bronze, nickel-bronze, brass, mild steel and stainless steel. Of the four stainless-steel blades inserted, two were hardened and the other two hardened and tempered. The turbine with this experimental wheel was set to work in the autumn of 1916, and opened up for the first time in April, 1918, when all the blading was found to be in good condition, although the stainless-steel blades were the only ones entirely free from erosion or corrosion, the greatest sufferers being the brass blades.

\* Abstract of article entitled "Some Engineering Uses of Stainless Steel," published in the Oct. 28 issue of *Engineering*, London, England.

### Blades Unaffected by Service

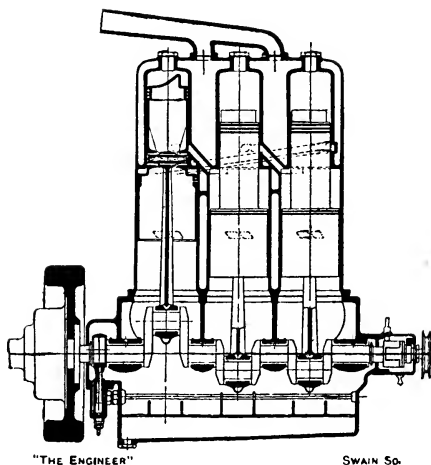
The machine was again put into operation and re-examined last July, when it was found that the stainless-steel blades appeared to be absolutely unaffected by their service. It is worthy of note that the hardened and tempered blades were in as perfect a condition as the hardened blades. The phosphor-bronze, the nickel-bronze and the brass blades, on the other hand, showed the usual erosion at the inlet edges and to about the same extent in all cases. The mild-steel blades were not merely eroded, the inlet edge having lost one-sixteenth of an inch, but were also corroded generally, the surface being uniformly roughened. Mr. Samuelson, in experimenting with new materials, quite naturally preferred in the first instance to attempt no exceptionally drastic experiment and had accordingly selected for his trial a wheel in which the blading was short, the stresses low and vibration absent, so that his test, while demonstrating the resistance to corrosion of the stainless-steel blades, afforded no data for estimating the mechanical value of the material.

This lack has, however, been made good by another customer of Messrs. Firth & Sons, the makers of the steel, who some four or five years ago fitted into a turbine stainless-steel blades 28 in. long, and now reports that these blades have given entire satisfaction. Subsequently, Messrs. Firth themselves experimented with stainless-steel blades in one of the turbines at the power station of their Tinsley works, Sheffield. The machine selected for the test was a British Westinghouse impulse turbine, rated at 2,000 kw. and running at 3,000 r.p.m. This turbine was installed in 1916 and has been in almost constant use ever since, at loads ranging from full load down to one-quarter load. The steam supply is furnished at a pressure of 200 lb. per sq. in. (gage) and at a temperature that has averaged about 600 deg. F. The turbine in question has one velocity stage with two rows of moving blades with a mean diameter of 3 ft. 7½ in. followed by seven simple impulse stages, 4 ft. 1½ in. in mean diameter. The blading originally supplied to this turbine was a nickel steel containing 0.19 per cent of carbon and 4.71 per cent nickel.

### The Messrs. Firth Begin Experiments

It was not till June, 1920, that Messrs. Firth were themselves able to take up Mr. Brearley's suggestion made in 1912, and began experiments of their own on the suitability of stainless steel for steam-turbine blading. On that date the turbine already described was opened up and experimental blades were fitted to two of the wheels, constituting the first, or velocity, stage of the turbine and the last stage, which is fed with wet steam. In the latter stage the blades are subject to the heaviest centrifugal and bending stresses. These blades are 7 in. long and ¾ in wide, while the velocity-wheel blading contains six blades of stainless steel, three being highly polished and the remaining three in the unpolished condition. On the opposite side of the wheel three more stainless-steel blades were inserted alongside of three new 5 per cent nickel-steel blades obtained from the builders of the turbine. In the velocity blading, 24 blades were replaced by 21 blades of stainless-steel (three of which were polished) and by three new blades of 5 per cent nickel steel. These blades were ⅞ in. long by ¼ in. wide. The stainless steel used contained 13.4 per cent of chromium and 0.30 per cent of carbon.

The turbine was recently opened up after having operated 3,471 hours with the experimental blading. The stainless-steel blades appeared to be totally unaffected by the work done, as no corrosion and no erosion could be detected either by the eye or by touch. The inlet edges, where erosion is always most marked, were perfectly smooth, while those of the new nickel-steel blades inserted at the same time were materially roughened.



and these blades had suffered corrosion. In the case of the nickel-steel blades originally fitted in 1916, the erosion was very noticeable, and the blades were deeply pitted and corroded. When the turbine was opened up, there were found to be some markings on the stainless-steel, but these were easily removed with a damp rag, leaving a perfectly clear and smooth surface. These experiments seem to show that stainless-steel is superior both to phosphor-bronze and to nickel-steel as a material for turbine blades.

Another interesting engineering application of stainless steel is to the rams of hydraulic pumps. A test pump supplying water at a pressure of 1,000 lb. per sq. in. has been at work since 1915. One of the rams is of stainless-steel, and the other of phosphor-bronze. The stainless-steel ram has maintained its original polish much better and has worn down only  $1/64$  in. as against  $7/64$  for the phosphor-bronze.

All the experiments so far made with this material seem to indicate that it has great promise as an engineering material and will find many new uses. In this connection it should be noted that the methods of forging, heat treatment, etc., must be adapted to the special properties of stainless steel. As an example of the ways in which this alloy differs from ordinary carbon steel, it may be noted that stainless-steel retains most of its strength up to a dull-red heat.—*Power*, 20 December, 1921.

**A VALVELESS GEARLESS ENGINE.**—We are informed by a correspondent that an internal combustion engine embodying some novel features of design has just been constructed for the inventor at the G. D. S. Works, Manchester. The bench tests have been remarkably promising, and the engine will shortly be installed in the chassis, and the car will be used for demonstration purposes. The engine is the invention of Mr. W. F. Wege, an Australian engineer.

It is a "two-stroke," built with three (or multiples of three) cylinders. Other than the ports, there are no valves, there is not a single gear wheel in the engine, and all cams, shafts, tappets and springs, and even the timing gear, are eliminated. The moving parts consist only of the crank shaft, pistons and connecting-rods. The experimental engine is rated at 10 horse-power, and on bench tests has developed 20 horse-power. The cylinder blocks, as shown in the accompanying cut, are designed with two diameters having a common piston, which is connected to the crank shaft in the usual way by a connecting-rod. The lower or pump chambers of the cylinders are connected by a common manifold inlet, which in turn is coupled to the carburetter.

The cycle of operation is as follows:—On the down stroke of the piston a vacuum is formed in the pump chamber, and at the end of the stroke the exhaust port in the explosion chamber is uncovered. So also is the inlet port of the lower chamber, into which the gas then enters. On the return stroke the charge is compressed, and when the transfer port is opened, is passed into the explosion chamber of the adjoining cylinder. In like manner the second cylinder feeds the third, and the third transfers its charge to the first.

The engine has been designed to meet conditions existing in Australia, which call for a car light but strong, with a good clearance and a wide track, but above all, with a power unit simple of construction. Motoring in Australia soon carries one beyond the reach of repair shops, and what may have to be done by the wayside to car or engine must be as simple as possible. When the Wege engine has passed through the strictest of tests here, on the road and in the laboratory, the company intends to build in Australia for Australia.—*The Engineer*, 16 December, 1921.

## NAVIGATION AND RADIO

### COAST SURVEY'S ACTIVITIES IN MEASURING EFFECT OF CURRENTS

The annual report of the Director of the Coast and Geodetic Society has just been issued. It contains much that is of interest to the public and dwells especially on the need of more extended current observations, to the lack of which is attributed the loss of many vessels and lives. The situation is summed up in the following quotation from the report:

"During the years from 1900 to 1921 there were stranded or wrecked on the Pacific Coast of the United States more than 100 vessels involving a loss of hundreds of lives and millions of dollars in property, and this is in spite of the fact that our navigators on the Pacific Coast comprise an unusually able, keen and alert group of men. To a large extent this loss was due to the lack of knowledge of the effects of the currents on the Pacific Coast. Had there been adequate knowledge of these currents, a large part of this enormous loss certainly would have been prevented.

"In the safeguarding of life and property on the Pacific Coast a knowledge of the currents is of the utmost importance, for in the more than thousand miles of coast line that stretches from the Mexican border to the Strait of Juan de Fuca, harbors are many miles apart, sailing courses long, and periods of thick weather are of comparatively frequent occurrence.

"Appropriations for the observation of currents have to the present time been so small as not to permit the maintenance of a vessel for making a detailed systematic study of the treacherous and little-known currents of the Pacific Coast. By taking advantage of the five light vessels stationed along the coast, the Survey has at little cost secured observations which have brought out the important fact that, contrary to the belief of the mariner, a wind creates a current not in its own direction, but in a direction about 20° to the right of the wind. The importance of this discovery lies in the fact that a wind blowing parallel with the coast may

produce a current which tends to set a vessel on the shore, a fact which until now has been unsuspected by the navigator.

"Given the modest appropriation necessary to carry into effect the plans outlined for a systematic survey of the currents along the Pacific Coast, a long step will have been taken toward the safeguarding of life and property in the navigation along that coast.

"The appalling loss of life and property in the wreck of the *Alaska* on August 7th on the Coast of California is a compelling argument for the charting of the currents on the Pacific Coast. Only one explanation of the wreck has thus far been offered. The second officer of the *Alaska* declares that an uncharted northeast current dragged the fog-bound ship several miles inshore into the reef."—*Nautical Gazette*, 24 December, 1921.

**BENSON RECORDING COMPASS.**—When a vessel's master lays out a course, he can not be positive that it is being followed by the wheelman or quartermaster, unless he is constantly checking it up. The vessel may be working off the course with a resultant extra mileage, increase of running time and enlarged fuel consumption. The fact that a captain finds the ship on her course upon his return to the bridge after an hour's absence on other duties affords no guarantee of her having sailed continuously on the true course during that hour.

The Benson recording compass, (of which about forty are now in use) gives a vessel master a continuous record of the ship's movements. It is usually installed in the captain's cabin but may be installed in any other place if he so prefers. By a glance he can tell how the vessel is working, or what has happened during any interval of time which may have elapsed. The slightest change in direction and the actual time at which it occurred is automatically and accurately registered by this instrument.

This accurate record of the heading of the ship and of the time required for each maneuver is secured by means of a special compass to which a small pivoted arm tipped with a pointed stylus set at right angles to the arm and in contact with the record chart is attached. The chart on which the record is made has a series of concentric circles indicating the periods of time. Intersecting these circles is a series of equally spaced lines each corresponding to the arc of circles described by the pivoted recording arm. The stylus corresponds to the "lubber mark," each line terminating at a compass point on the margin of the record chart. It makes a white dot on the chart every three seconds.

When a vessel is on a straight course this dot becomes a line, but should she swing rapidly this line is composed of a series of dots thus giving prominence on the record chart to any sudden or unusual movement. No ink or dye is used on the chart, as it has a smoked surface. When the chart is removed it is dipped in a fixing solution, making a permanent record which will not be defaced in handling. The perfection of the Benson recording compass was first proven by a thorough test on a submarine during which every movement of the undersea boat was recorded with the greatest accuracy.—*Nautical Gazette*, 31 December, 1921.

**POLAND AND U. S. TO HAVE DIRECT RADIO COMMUNICATION SOON.**—A contract for the erection of a powerful wireless station near Warsaw, Poland, has been awarded to the Radio Corporation of America. The station, which will cost between two and three million dollars, will form a link of communication between Poland and the United States which will facilitate commerce between the two countries.

At the present time cable communication between Poland and the United States is far from being satisfactory. Messages passing between the two countries must of necessity pass over lines owned and operated by com-

panies with neither Polish nor American interests. In many cases it has been necessary for messages originating in Warsaw and destined for New York to pass over the lines of a number of different telegraph and cable companies, and with every one of the repetitions and reforwardings there is a possibility of errors and delays.

With the completion of the new radio station delays and errors will be eliminated and business men in Poland will be able to thrash out their transactions with the commercial heads of America with almost the same speed that obtains in a personal interview. The new radio station recently opened on Long Island will operate directly with the Warsaw station when it is completed. The transmitting unit which will be placed in operation in Poland will be similar to, although smaller than, that being installed on Long Island. A number of improvements in the science of radio telegraphy will be embodied in the Polish equipment, and with very few changes the station could be used for radio telephony. In conjunction with the antennae a system will be employed which will eliminate the formation of sleet and ice on the wires. This will be accomplished by passing a heavy electric current through the wires which will become heated in consequence. In a climate like that of Poland this is an important feature, for ice would form on the wires during the winter, and the added weight being too great for the tensile strength of the wire, would cause the antennae to collapse.

Long-range radio is quite different from the kind employed on commercial vessels for the systems used are entirely different. The power of the former is approximately 100 times as great as that of the latter. It has been found inadvisable to attempt to have the receiving apparatus located in the same building as the transmitter, for in long distance transmission it is essential for the stations to be capable of duplex operation. They must be able to send and receive simultaneously, which is not common with the radio equipment found on vessels.

Showing the need of direct radio communication between America and Poland, competent investigators have stated that one-fifth of all persons of Polish extraction are residents in the United States. In proportion to the native population, this is a higher percentage than the case of the nationals of any other country.—*Nautical Gazette*, 24 December, 1921.

**RADIO DIRECTION FINDERS AID RESCUE WORK AT SEA.**—Commissioner of Lighthouses George R. Putman is calling attention to two striking illustrations of the importance of radio bearings in rescue work at sea. The Norwegian steamer *Onataneda* was in distress off Newfoundland and gave her position by dead reckoning 90 miles in error. The only ship able to discover her correct position was the steamship *Fanad Head*, equipped with a radio direction finder, which was thereby enabled to save the lives of those on board of *Onataneda*.

The steamer *Wahkeena* was within 14 miles of the steamer *Alaska*, recently lost off Cape Mendocino, Cal., when she picked up the latter's radio distress signals. It was 10 hours, however, before the *Wahkeena* reached the scene of the wreck, as she had no means of determining the direction of the signals. Many lives might have been saved had there been a radio fog signal on Blunts Reef Light Vessel and radio compasses on the *Alaska* and *Wahkeena*.—*Nautical Gazette*, 16 December, 1921.

### ORDNANCE

**A 4000-POUND AIRCRAFT BOMB.**—The Ordnance Department of the Army is making plans for an ariel bomb to weigh 4000 pounds, which is very much larger than any bomb of the kind ever before conceived in the United States. It is to contain over 50 per cent or 2400 pounds of

TNT, and will be one of the most deadly of all bombs known in modern warfare. Up to the present the largest bombs designed and constructed weigh but 2000 pounds. These already have been adopted as standard, together with bombs weighing 1100 pounds, 600 pounds, 300 pounds, and 100 pounds, respectively, all of which contain about 50 per cent of TNT. The new bomb weighing 4000 pounds are to be used in connection with the largest bombing airplanes.—*Scientific American*, December, 1921.

### MISCELLANEOUS

RELEASE OF NORWEGIAN SEALERS.—The three Norwegian sealers which were seized by the Bolsheviks in June have now been released and permitted to return to Bergen, while the matter of the very heavy fines imposed for alleged illegal sealing are now the subject of discussion by the Soviet authorities at Moscow. The help given by the Norwegians to the famine-stricken areas is the reason for the reconsideration of the matter.—*The Marine Engineer and Naval Architect*, December, 1921.

MINES IN THE MEDITERRANEAN.—Mines are still proving themselves very troublesome in the Mediterranean, one of the most important casualties of the month being the Italian steamer *Chile*, a 3,218 ton ship launched in 1885 as the Greenshields Cowie *Knight of St. John*. She struck a mine off the south coast of Greece while carrying wheat to Russia and sank in a very short time. All the crew were saved.—*The Marine Engineer and Naval Architect*, December, 1921.

ITALIAN VESSEL OVERWHELMED BY STORM.—The Italian destroyer *Centauro* sank today in a violent storm off the Island of Trianesia.

The crew were all rescued, and active efforts are being made to save the destroyer.—*Naval and Military Record*, December, 1921.

MOTOR LAUNCHES IN MOROCCO.—In their campaign against the Riffs in North Africa, the Spaniards are making great use of the six 80 ft. motor launches which they purchased from the Royal Navy after the Armistice. They are able to get close inshore and do considerable damage with their machine guns, while their rapid manœuvering has up to now puzzled the Moorish gunners.—*The Marine Engineer and Naval Architect*, December, 1921.

### CURRENT NAVAL AND PROFESSIONAL PAPERS

Speed Reduction for Ship Propulsion—*The Marine Engineer and Naval Architect*, December, 1921.

Strategy and Tactics of Small Wars—*Marine Corps Gazette*, December, 1921.

Recent Developments in the Krupp Works at Essen—*The Engineer*, 9 December, 1921.

Viscosity of Steam Turbine Oils—*Power*, 27 December, 1921.

Transmission Characteristics of the Submarine Cable—*Journal of the Franklin Institute*, December, 1921.

The Exponential Method in the Analysis of the Balance of Reciprocating Masses—*Engineering*, 9 December, 1921.

The Radio Central—*Scientific American*, January, 1922.

Bombing and Bombing Sights—*Scientific American*, January, 1922.

Researches on Modern Brisant Nitro-Explosives—*Reprint and Circular Series of National Research Council*, Number 15.



# NOTES ON INTERNATIONAL AFFAIRS

FROM DECEMBER 10 TO JANUARY 5

PREPARED BY

ALLAN WESTCOTT, Professor, U. S. Naval Academy

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## WASHINGTON CONFERENCE

**AMERICAN RESERVATIONS TO PACIFIC ISLANDS TREATY.**—The four-power treaty regarding the Pacific Islands, the contents of which were published in the December issue of the PROCEEDINGS, was signed in Washington on December 13. The American delegates signed with reservations expressed in the following explanatory note, which was accepted by the other signatories:

In signing the treaty this day between the United States of America, The British Empire, France and Japan, it is declared to be the understanding and intent of the signatory powers:

1. That the treaty shall apply to the mandated islands in the Pacific Ocean, provided, however, that the making of the treaty shall not be deemed to be an assent on the part of the United States of America to the mandates and shall not preclude agreements between the United States of America and the mandatory powers, respectively, in relation to the mandated islands.

2. That the controversies to which the second paragraph of Article 1 refers shall not be taken to embrace questions which according to principles of international law lie exclusively within the domestic jurisdiction of the respective powers.

Washington, D. C., December 13, 1921.

**PACIFIC TREATY INCLUDES JAPANESE HOMELAND.**—In view of the interpretation made by President Harding and others that the Pacific Islands Treaty did not apply to the islands of the Japanese archipelago proper, the American delegates stated that it was the understanding of those who negotiated the treaty that the Japanese homeland was so included. The Japanese delegates on December 27 announced to newspaper correspondents that Japan was indifferent as to the inclusion of the main land, and regarded the matter as of minor importance. It appeared likely that an agreement excluding the Japanese homeland might be embodied in a protocol to the original treaty.

**NAVAL AGREEMENTS.**—It was anticipated that upon the conclusion of conference sessions in January, the naval agreements reached would be em-

bodied in a treaty to be signed by the five participating powers. The agreements reached up to January 5 were summarized thus:

First—An agreement by the five naval powers by which America, Great Britain and Japan will scrap sixty-eight capital ships of an aggregate displacement of 1,861,643 tons.

Second—that after the naval holiday and the completion of replacement, the capital ship tonnage of the five principal powers shall be in the ratio of 5—5—3—1.67—1.67, that is, that the replacement capital ship tonnage of Britain and the United States shall be 525,000 tons each, that of Japan 315,000 tons, that of France 175,000 tons, and that of Italy 175,000 tons.

Third—that the size of future capital ships shall be limited to 35,000 tons per ship.

Fourth—That in the event that all five of the nations build individual capital ships up to the displacement limit of 35,000 tons a ship, England, after replacement, would have fifteen capital ships, America fifteen, Japan nine, France five and Italy five. On this basis the five fleets would have a maximum of only forty-nine capital ships, each of not more than 35,000 tons, or an aggregate tonnage for the forty-nine vessels of 1,715,000 tons, less for all five than what it is proposed that three nations shall scrap.

Fifth—That no capital ship shall mount any gun of more than 16-inch calibre.

Sixth—That there shall be a naval holiday in the matter of capital ship construction running for ten years during which neither the United States nor Japan will build capital ships, exception being made only in favor of two modified Hoods to be built in that period by the British, and several of the French replacement capital ships, to be started before the expiration of the holiday.

Seventh—That a limitation be put on the construction of aircraft carriers on the basis of 135,000 tons for the United States, 135,000 tons for Great Britain, 81,000 tons for Japan, 60,000 tons for France and 60,000 tons for Italy, no carrier to be of greater individual displacement than 27,000 tons, the few existing airplane carriers to be considered as "experimental" and scrapped as soon as replaced.

Eighth—No limitation on the extent of submarines or auxiliary surface combatant craft, such as light cruisers, destroyers and flotilla leaders, to be built by any nation, other than aircraft carriers, failure to agree in this respect being due to the decision of the French Government that it needs 90,000 tons of submarines and 330,000 tons of auxiliary surface craft.

Ninth—An agreement on the size of cruisers and other auxiliary craft. The conference has agreed that no war vessel other than a capital ship or airplane carrier shall be of greater displacement than 10,000 tons, but this has not been approved by the French delegation, which has asked for instructions on the subject from its Government.

Tenth—No vessel other than a capital ship is to carry any gun with a calibre in excess of eight inches.

NO FORTIFICATION OF PACIFIC BASES.—On December 15 the U. S. State Department made the following announcement of agreement reached with respect to naval bases in the Pacific:

It is agreed that with respect to fortifications and naval bases in the Pacific region, including Hongkong, the *status quo* shall be maintained, that is, that there shall be no increase in these fortifications and naval bases except that this restriction shall not apply to the Hawaiian Islands, Australia, New Zealand, and the islands composing Japan proper, or, of course, to the coasts of the United States and Canada, as to which the respective powers retain their entire freedom.

Under the agreement for maintenance of the *status quo* to fortifications and naval bases in the Pacific the United States will refrain from further development of fortifications and advance bases at Guam and the Philippines, while Japan will refrain from further development of fortifications and naval bases in the Pescadores, Bonin Islands and O-Shima, and from building forts in other islands not a part of Japan proper. Similarly England will maintain the *status quo* with respect to fortifications and naval bases at Hongkong and other British islands.

NAVAL DEMANDS OF FRANCE.—At the opening of discussions regarding the French navy, the French delegates demanded a ratio of 3.5, which would enable France to build 10 capital ships. Secretary of State Hughes thereupon sent two notes to Premier Briand urging that this demand be modified. Premier Briand finally consented to the ratio finally adopted, that of 1.67, but insisted upon a much higher ratio for auxiliary ships, especially submarines.

England's appeal for abolition of submarines was not supported by the other four powers. Upon the demand made by France for a submarine tonnage of about 90,000, approximately equal to that of Great Britain and the United States, Secretary Hughes offered the following modification of the original proposals:

United States: Original plan, 90,000; new plan, 60,000.

Great Britain: Original plan, 90,000; new plan, 60,000.

Japan: Original plan, 55,000; new plan, 31,500.

France: Original plan not decided; new plan, 31,500.

Italy: Original plan undecided; new plan, 21,150.

This proposal was accepted by Great Britain. The French government, however, refused to recede from its original position, and no further effort was made to restrict auxiliary tonnage of any kind.

PROPOSED RESTRICTIONS ON SUBMARINE WARFARE.—In view of the failure to restrict submarine construction, Mr. Elihu Root on December 28, proposed a set of resolutions restricting the use of submarines in war. Art. I of these resolutions was merely a statement of existent international law, and as such was at once accepted in principle by all the powers. The second and third articles prohibited the use of submarines against merchant vessels; and they were therefore less readily acceptable. After consulting their home governments, the Japanese and French delegates expressed their willingness to accept the second and third articles "in principle," subject to further discussion of methods involved in the use of submarines in commerce warfare, including the definition of a merchant vessel and the use of submarines in blockade. The resolutions were finally accepted, as follows:

I. The signatory powers, desiring to make more effective rules adopted by civilized nations for the protection of the lives of neutrals and non-combatants at sea in time of war, declare that among those rules the following are to be deemed an established part of international law.

(a) A merchant vessel must be ordered to submit to visit and search to determine its character before it can be seized.

A merchant vessel must not be attacked unless it refuses to stop for visit and search after warning, or to proceed as directed after seizure.

A merchant vessel must not be destroyed unless the crew and passengers have been first placed in safety.

(b) Belligerent submarines are not under any circumstances exempt from the universal rules above stated, and if a submarine cannot capture a merchant vessel in conformity with these rules, the existing law of nations requires it to desist from attack and from seizure, and to permit the merchant vessel to proceed unmolested.

II. The signatory powers invite all other civilized powers to express their assent to the foregoing statement of established law, so that there may be a clear public understanding throughout the world of the standards of conduct by which the public opinion of the world is to pass judgment upon future belligerents.

III. The signatory powers recognize the practical impossibility of using submarines as commerce destroyers without violating, as they were violated in the recent war of 1914-1918, the requirements universally accepted by civilized nations for the protection of the lives of neutrals and noncombatants, and to the end that the prohibition of the use of submarines as commerce destroyers shall be universally accepted as a part of the law of nations they now accept that prohibition as henceforth binding as between themselves, and they invite all other nations to adhere thereto.

CONTROL OF AERIAL WARFARE.—The committee of experts, named to prepare a report on ways and means of controlling war airplanes, has completed its work, and the results of its labors are not encouraging, so far as action by the Washington conference goes. The task assigned the committee was in three parts. These, with the reply of the experts, stated briefly, are:

1. Usage—It is not feasible for a conference of five powers to lay down rules for the war use of airplanes, since all nations may have airplanes. Therefore, this matter can best be considered at a meeting of wider scope.

2. Number—In view of the essential similarity between peacetime airplanes and wartime airplanes, and the ease with which one may be converted into the other, and in view of the impossibility of limiting the number of peacetime airplanes that any nation may have, the committee is unable to make any recommendations as to the number of airplanes which a nation may have for military use.

3. Form—It is evident that a freight-carrying airplane may be easily converted into a bomb-carrying airplane; it is probable that any limit placed upon the development of fighting airplanes would be ineffective because the sporting and racing airplane of peacetime is developed along the lines of war planes. Therefore, the committee has no concrete proposals as to the control of the form of airplanes.

This is a summary of the experts' conclusions, which are stated at great length.

The report does not mean finally that the Washington conference can do nothing about regulating airplanes, but it does put into concrete form the difficulties of action here. With regard to airplanes, as with regard to poison gas and laws of war, the trouble about taking action here is that five nations can hardly be supposed to tie their hands with respect to use of some weapon of war if potential enemies are not subject to the same limitations.

An expert pointed out tonight that the League of Nations was working on the problem of controlling the inhumane use of airplanes in war and it seemed to him that the matter could be better considered at the next assembly of the League than at the Washington conference.—*New York Times*, 30 December, 1921.

**FRENCH VIEW OF NAVAL LIMITATIONS.**—The following extracts from an article entitled "London and Washington in Accord" in the French magazine, *La Vie Maritime*, suggest clearly the French view of Washington agreements. "The immediate, bold, peremptory presentation of such a programme [the Hughes proposals] at the opening session produced at first an effect of stupefaction. We suppose, however, that England previously had some idea of what was to occur. The diplomatic activity between London and Washington in the last few months has already been noted. The English delegate, Mr. Balfour, had the air of a man informed and convinced; he encouraged Mr. Hughes and found no difficulty in agreeing in principle to the American proposals. . . . Certain American journals have found occasion to applaud loudly the triumph of Washingtonian diplomacy, on the ground that it has induced Great Britain to abandon her maritime supremacy, and has achieved the freedom of the seas. But this is going too fast. In reality, the British fleet retains first rank, with 22 dreadnoughts against 18 American; and if she secures the eventual support of Japan, which is not improbable, she will have 14 units more than the United States. This is no longer the 'two-power standard,' but the time has not come for the descendants of Nelson to give up their traditional slogan, 'Rule Britannia.'

"France has not cut an important figure in all this. In fact, this is the first international conference in which we have taken part where we have been treated almost as a negligible quantity. Only Great Britain, the United States, and Japan are mentioned. The rest, so to speak, do not count. France and Italy, in this plan, are charitably allowed to retain the little naval strength they already possess. It appears too completely forgotten, indeed, that the French colonial empire is immense; that we are a far eastern power of the first rank, with valuable frontages on all oceans; that we have a frontier and interests in common with China, and possessions of great value in the Pacific. . . . If M. Briand returns empty-handed, or even with unsatisfactory terms, under whatever pretext or whatever their form, how shall he be received? It is a matter which concerns our future, even our existence."

### FAR EASTERN QUESTIONS

**CHINESE PROBLEMS UNSETTLED.**—At the renewal of sessions of the Washington conference in January, many of the questions relating to China awaited final settlement. It was predicted that Japan and China would ultimately reach an agreement for the surrender of Shantung, that Great Britain would relinquish Wei-hai-wai, and that a nine-power treaty would be drawn up embodying the various concessions to

China relative to control of customs, withdrawal of troops, relinquishment of foreign control of courts, postal service, etc.

Direct negotiations between Japan and China over Shantung ended on December 20 in a deadlock over the method by which China should take over and pay for the Shantung railway. The Chinese delegates on January 4 appealed to Mr. Balfour and Mr. Hughes to act as intermediaries in this matter.

The sub-committee on Chinese tariff reached a compromise proposal to the effect that China should be permitted to levy immediately an effective ad valorem tariff of 5%, as opposed to the present nominal 5% tariff which yields only  $3\frac{1}{2}\%$  owing to pre-war valuations on goods. This effective 5% tariff would be increased shortly to  $7\frac{1}{2}\%$ , and thereafter, upon abolition of the Likin, or provincial tax, to  $12\frac{1}{2}\%$ . The proposed 5% tariff would increase China's revenue by 10 million dollars.

GOVERNMENT OVERTHROW IN PEKING.—On December 13, Gen. Chang-Tso-lin, super-Tuchun and Inspector General of the three provinces of Manchuria, assumed the powers of dictator at Peking, forcing the resignation of the premier and cabinet. While the new powers in control were reactionary in character, it was hoped that they would succeed in establishing a stronger central government, with support from all factions in China. The new premier, Liang-Shih-yi, is a man of wealth, long prominent in Chinese politics and finance. His cabinet includes two hold-overs from the former ministry, Dr. Yen remaining Minister of Foreign Affairs.

JAPAN IN SIBERIA.—On January 2 delegates from the Chita government, or Far Eastern Republic, who had attempted unsuccessfully to secure a hearing in Washington, gave to the press what purported to be documents proving negotiations between France and Japan by which France agreed to support Japanese policy in Siberia in return for aid in restoring the former Russian régime. These documents were at once repudiated by both France and Japan.

The divergent reports of the Japanese and the Chita delegates regarding the situation in Siberia were summarized on December 29 as follows:

1. The Chita delegation says that the Japanese are demanding recognition by the Far Eastern Republic of treaties concluded with General Semenov, and with the present Merkuloff Government in Vladivostok, giving them executive rights in fisheries, hunting and the lumber business, as well as in certain mining industries.

The Japanese say they never made such treaties and would not ask the Far Eastern Republic to recognize them even if they had.

2. The Chita delegates say that the Japanese have demanded the right to own land, "which privilege no Russian citizen possesses in the Far Eastern Republic, and which even under the Czar was denied to all, including Russian subjects."

The Japanese, however, say that they do not demand the right of land ownership. At present, according to their version, no foreigner is even permitted to lease land in Siberia. They would be satisfied with an agreement permitting leases on moderately long terms—not necessarily ninety-nine years or anything like that, but long enough to give an invest-

ing company a chance to get a fair return on their capital. And this privilege, they say, they are asking for all foreigners on equal terms, and not only for themselves.

3. The Chita delegation asserts that the Japanese request of the right to maintain "representatives" in the cities of the Far Eastern Republic does not refer to consular representatives, but that the demand has been made at Dairen that Japan be allowed to retain garrisons in the principal cities.

The Japanese profess the intention of withdrawing all their forces, except those in the province of Sakhalin, if they can get adequate guarantees for the safety of the lives and property of Japanese subjects.

The Japanese contention all along has been that they needed adequate guarantees for the safety of the lives and property of their subjects in Siberia, especially those in the Vladivostok district, who number some 8,000, and most of whom had a good deal of property before the Russian revolution. Consequently, they argue, order must be restored and a viable Government formed before their troops can be withdrawn. The Far Eastern representatives hold that the maintenance of order and the guaranty of life and property has been made difficult chiefly by insurrections promoted by the Japanese.—*New York Times*, 30 December, 1921.

OCCUPATION OF SAKHALIN.—In Northern Sakhalin, according to reports from Russian sources, the Japanese are employing measures clearly indicating their intention of permanent occupation, including abolition of local self-government, classification of Russians as foreigners, and establishment of Japanese language, courts, and laws.

## GREAT BRITAIN

ULSTER REFUSES TO ENTER IRISH STATE.—The Ulster Cabinet, in a letter to Premier Lloyd George published on December 15, definitely refused to enter the Irish Free State, choosing instead to exercise their privilege of maintaining a separate government under the Government of Ireland Act of 1920. The Ulster letter objected to the new oath as implying a lower standard of loyalty, and declared that the financial provisions of the agreement would introduce tariff war with England and internal disputes in Ireland. Objection was made to the provisions for altering the boundary between Ulster and the new state.

DISORDERS IN EGYPT.—Following the failure of negotiations between Great Britain and Egypt over the terms of Egyptian independence, the Egyptian premier, Sir Adley Yeghen Pasha, and his Cabinet resigned. No successor was immediately found, and the downfall of the government was followed by disorders in Alexandria and other cities, instigated by the Nationalist leader, Said Zaghlul Pasha. On December 23 Zaghlul was arrested in Cairo and taken to Suez. Two battleships and additional British military forces were dispatched to Egypt.

RESULTS OF INDIA NATIONALIST CONGRESS.—An All-Indian National Congress, representing the native agitation against British rule, was held at Ahmedabad on December 27-29. The primary result was the adoption of a resolution giving the native agitator, Mahatma Ghandi, sole executive power, and embodying a decision to carry on the anti-British campaign by all "legitimate and peaceful" means. This policy of

passive resistance includes non-payment of taxes and enrollment of volunteers.

The Congress declared that while aiming at *Swaraj*, or popular rule, it did not seek complete severance from the British Empire, provided the British people redressed India's wrongs. This was a concession to moderates in the convention. The *hartal*, or forced non-participation in activities accompanying the Prince of Wales' visit, was attempted with varying success.

### RUSSIA AND BALTIC STATES.

**LITHUANIA REJECTS LEAGUE PLAN.**—*Kovno, Lithuania, Dec. 28 (Associated Press)*—Lithuania has replied to the President of the Council of the League of Nations declining to accept the Council's recommendations for a settlement of the dispute between Poland and Lithuania over Vilna. The Lithuanian communication asks that Lithuania be permitted to elucidate her attitude at the next meeting of the Council.

The league of Nations' plan to terminate the dispute between Lithuania and Poland over Vilna, included the creation of two semi-autonomous Lithuanian cantons, one comprising the Vilna region and the other the remainder of Lithuania.—*New York Times*, 29 December, 1921.

**TRADE AGREEMENT WITH ITALY.**—*Rome, Dec. 27. (Associated Press)*.—The terms of the commercial agreement between Italy and Soviet Russia, which was signed yesterday by Marquis della Torretta, the Foreign Minister, and M. Vorovsky, the Soviet representative, were published today by the Rome newspapers. It is merely temporary and provides for the resumption of trade between the two countries pending negotiations for a general economic treaty.

**\*AMERICAN POLICY MORE FAVORABLE.**—*Washington, Dec. 27.*—Changes in Soviet governmental policies, recently made—or indicated as in prospect—may eventually bring about a resumption of trade relations between Russia and the United States, it was said today at the White House.

Reports received recently by the American Government, it was added, were most optimistic as to the course likely to be pursued by the Soviet authorities.

The American Government, it was stated, already has responded to the change in Russian policy by admitting to the United States a Russian agent to buy grain for Russian relief enterprises.

The estimates recently submitted to Congress by the Administration, it was recalled today in other quarters, called for an appropriation for the salaries of two Trade Commissioners and one clerk in Russia.—*New York Times*, 28 December, 1921.

**RUSSIA TO MAINTAIN ARMY.**—*Moscow, Dec. 29 (Associated Press)*.—The Soviet army and navy, now totaling 1,505,000 men, must not be reduced, but on the contrary must increase training and be prepared for war next spring and summer in the event that outside foes carry out their plans to attack Soviet Russia, declared Soviet Minister of War Trotsky in a fiery speech before the ninth All-Russian Congress today.

Trotsky announced to the Congress the capture of Khabarovsk, in Siberia, by the White Guards "in the presence of Japanese bayonets."

"Now can we remove our troops from the Far East?" he demanded rhetorically. "No. We can only regret there were not enough of them. But we are certain that in the future enough Red bayonets will be there to hold back the pressure."—*New York Times*, 30 December, 1921.



## GERMANY AND CENTRAL EUROPE

**DELAY IN REPARATIONS PAYMENTS.**—In a note to the Reparations Commission on December 15 Chancellor Wirth of Germany stated that it was impossible to meet the reparations installments due on January 15 and February 15, amounting to one billion gold marks. Not more than 150,000,000 marks could be paid, apart from deliveries in kind and credit for "recovery acts"; and efforts to float a loan in Great Britain had failed.

One of the main purposes of the meeting of the Supreme Council at Cannes on January 6 was to consider the question of German payments. Prior to the meeting Premier Briand pledged himself to the French Chamber that he would insist that Germany fulfil all obligations. On the other hand it was tacitly agreed at the previous conference in London that Germany should be required to pay only 500,000,000 marks of the two billion due this year.

**ODENBURG TO HUNGARY.**—The plebiscite in December in the town and district of Odenburg resulted in a large majority for union with Hungary. The plebiscite was provided for by the protocol made at the Venice Conference on Austrian problems. While the Austrian Government consented to the plebiscite, the result was a severe disappointment. The Austrian president, Michael Hanish, afterward declared his unwillingness to ratify the Venice agreement, and denounced the plebiscite as illegal owing to the tardy removal of Hungarian troops from the district.

By pledging the famous Gobelin tapestries Austria succeeded at the close of December in raising a loan of £3,000,000 in London, sufficient to tide the country over until a further credit is granted through the League of Nations.

**HUNGARIAN PEACE TREATY RATIFIED.**—The Hungarian National Assembly on December 12, ratified the Treaty of Peace between the United States and Hungary. Count Széchenyi was appointed American Minister.

## LATIN AMERICA

**TACNA-ARICA NEGOTIATIONS CANCELED.**—Negotiations between Chile and Peru for arbitrating the Tacna-Arica dispute in Washington were dropped because of unwillingness on the part of Chile to submit to arbitration anything save Article III of the Treaty of Ancon relating to the method of holding a plebiscite in the disputed region. Peru, fearing the results of a plebiscite at this time, wished to reconsider the entire treaty. Chile rebuffed Bolivia's attempts to enter the negotiations in an effort to secure a sea outlet, declaring that Bolivia had no legitimate concern in the dispute.

**ANTI-AMERICAN ACTIVITY IN MEXICO.**—*Washington, December 25.*—While seeking American recognition of the Obregon Government, Mexico has been conducting propaganda in various parts of Latin America for alienation of the friendship of these countries from the United States and their definite alignment with Mexico, according to reports that are coming out through well-informed American and Latin-American sources.

These reports have it that at no time since Carranza conceived his hatred of the United States, has the campaign of propaganda initiated by him abated. The campaign, it is asserted, may be divided into three phases, as follows:

1. The attempt to induce the secession of Los Altos, that part of Guatemala adjoining Mexico on the west coast and its annexation to Mexico.

2. The support of the movement for a federation of Central America and its eventual union with Mexico.

3. The sending of diplomatic representatives to the Central American countries with instructions to work for federation, Mexican supremacy and hostility toward the United States.

Evidence of this conduct on the part of the Mexican Government is said to be in the files of the State Department.—*New York Times*, 26 December, 1921.

## REVIEW OF BOOKS

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INVENTION; THE MASTER-KEY TO PROGRESS, by Rear Admiral Bradley A. Fiske, LL.D., United States Navy—New York, E. P. Dutton & Co. \$4.00.

Invention has assuredly not lacked annalists. Going no further back than the reign of King Charles II of England, we find the Marquis of Worcester inditing his quaint *Century of the Names and Scantlings of Such Inventions as at Present I Can Call to Mind and Have Tried and Perfected*. After him, at diminishing intervals, comes a long line of successors, notably Beckmann in Germany at the end of the XVIIIth Century, (whose classic *History of Inventions* translated into English, the reviewer's childhood's companion, still has a place on the shelves of his library); Edward Somerset, who in 1825, published *A Century of Inventions*; Edward Everett Hale, author, in 1887, of *Lights of Two Centuries*; not to mention scores of others at various times and in various languages. So far as the reviewer knows, all such works are strictly historical. They seldom fail to record a lively appreciation of the benefits brought to mankind by the inventor but do not create what may be termed a philosophy of invention. The facts are given, not always correctly, but with due credit to the inventors. That, underlying these gifts to humanity, there is a world-wide movement towards a desired but unrecognized end seems to have escaped the notice of the several writers. They could not see the wood for the trees.

And now comes one who unites in his own person certain qualities which are usually found existing apart and never before in one individual. for Admiral Fiske is author; naval officer and inventor. To these attributes must be added a fourth, that of philosopher. Granting freely the three which none will deny, let us consider the unclaimed status under the last head. But, first of all, we should clear the ground by stating briefly what material is contained in the book here reviewed. Substantially, it is a complete and most valuable running story of man's achievements in the line of the subject treated. The number of departments of human activity is surprisingly great. They embrace everything from prehistoric flint weapons to modern artillery; from the *Novum Organum* of Bacon to sewing machines; from spinning jennies to types of government; from Vasco da Gama to Pasteur!

The reviewer inclines to the opinion that more stress might well have been laid upon the invention—or discovery, as you will—of how to make a

fire. From that moment only, progress was possible and men permanently differentiated from animals. Civilization may be said to have begun then.

The attribution of the art of printing by metal types to John Gutenberg can not pass unchallenged in spite of the noisy tributes and the huge statue erected to his memory in Germany on the occasion of the five hundredth anniversary of his birth. The *Encyclopedia Britannica* is absolutely positive in stating that "the invention of printing with movable metal types took place at Haarlem about the year 1445 by Lourens Janszoon Coster."

The author properly defines an invention as of three stages, "Conception, development and production." Applying this test to the case of Copernicus we find, as Admiral Fiske says, "Copernicus was not the first to conceive the idea that the earth turns on its own axis or that the earth revolves around the sun," the old Pythagorean theory that Copernicus doubtless absorbed in Padua when a student there. His great merit lies in "development and production," not in "conception." Hence it seems unfair to the ancient Greek astronomer to give the name "Copernican" to a system which Copernicus did not actually invent, although he did make it "usable."

Personally, the reviewer holds Pasteur to have been the greatest inventor, as well as benefactor, of the XIXth Century, with Lord Kelvin a close second. Upon Pasteur's work is based the modern practice of medicine and surgery. Without his preliminary labors, research and results, it is impossible to imagine how Eberth, Kock, Sternberg, Loeffler, and Nikolaier could have made their valuable discoveries. By his work on ferments, the malady of silk worms, rabies and anthrax, he proved that every infectious disease is due to a particular germ and later he developed the antitoxin which has saved countless lives. In short, Pasteur blazed the trail for those Germans and for Lister to follow. The latter, in a speech delivered in Paris in 1900 said he had done no more than seize upon Pasteur's discoveries and apply them to surgery. In view of these facts it would appear that the author has given Pasteur less than his due meed of praise. One wonders whether the authorities chiefly consulted were not predominantly German.

Again, the reviewer seems to remember a slotted screw breech plug in a gun much older than 1849, the date ascribed to this invention.

Admiral Fiske states in italics that "*The Monitor's battle was the only battle [in the Civil War] in which the light of genius shone on either side.*" Was not Farragut's running past Forts Jackson and St. Philip to reach his real objective, the city of New Orleans, a stroke of genius?

The remarks immediately preceding are to be taken as suggestions of what might possibly have been more strictly just rather than as carrying criticism.

We are accustomed to regard "an invention" as something material and tangible, hence the author's employment of that word in connection with systems of philosophy, methods of government and modes of conducting warfare comes as a surprise. Nevertheless, by his definition, already quoted, it is abundantly warranted and Alexander, Cæsar, von Moltke,

Francis Bacon, the founders of our own Constitution, may rightly be classed among inventors since their work is characterized by the three conditions, "conception, development and production." Nor can this distinction be denied to Archimedes; to Hero, who made the first steam engine; to the unknown creator of the "*corvus*" which gave the Romans victory over the Carthaginian fleet; or to the maker of Greek fire, which routed a Turkish fleet in the VIIth Century. To all of these, among many others, Admiral Fiske does honor in this extremely interesting volume.

Speaking of the gun, through which lasting superiority over the barbarians was assured to, and is maintained since by, civilized man, the author pertinently calls attention to an unrecognized yet most important feature common to all inventions in words which merit careful study, "As the gun was a piece of mechanism, it possessed the attribute which seems to give to pieces of mechanism an element of superiority over every other thing in the universe, the attribute of continual improvability. Human beings do not possess this attribute, nor does any other thing in nature, so far as we know." By this expression he does not, it is presumed, mean that, by careful selective breeding, the best that is in plants and animals may not be brought out and made more or less permanent, but these possibilities are already existent even when latent. Indeed, the writer goes on to say, "Every human being begins where his father did—and so does everything else on earth; though human invention has recently made it possible for certain plants to be improved [as mentioned in the foregoing sentence]. No new invention ever dies as a man does, even if the material parts or immaterial parts that compose it are destroyed. On the contrary, it lives, in the sense that it exists as a definite usable entity, and also in the sense that it continues to propagate. And the things that it propagates do not begin as helpless and useless babies, but as mature creations. The first completed gun is still the model for the gun that men make now, and will continue to be the model for all guns in the future." (p. 106).

The subsequent remark (p. 326), a summation of these ideas, is strikingly true: "*The influence of invention is cumulative.*" The italics are his own. Nor is this reflection less suggestive: "Now to bring the gun and its accessories to the high standard they have now reached, the resources of virtually all the physical sciences have been required and utilized so that, while modern civilization was made possible by the gun, and could not have been made possible without it, the modern gun has been made possible by civilization and could not have been made possible without it. This mutuality between civilization and the gun is evident in the relations between civilization and every other great invention." (p. 108.)

The principal events in the history of invention, which necessarily includes the development of the physical sciences, are touched upon but only too briefly, the modest size of this volume forbidding lengthy treatment. None are overlooked, hence the book may be accepted as a trustworthy *vade mecum* to him who seeks to penetrate more deeply into its fascinating subject.

Particularly valuable are the author's observations of the "Machine of Civilization," the result of countless inventions and on the necessity as well as dearth of trained men to operate the "Machine of Government." "But the Machine of Civilization is composed not only of material parts, such as come within the province of the engineer, but also of immaterial parts; in fact, the principal parts are men, and especially the minds of men. It is the office of the Machine of Government to handle the men. It is also its office to direct their minds; because unless those minds view things correctly, the Machine of Government cannot work with smoothness. Now, men are inferior to machines in one important way: men, as men, cannot be improved. It therefore devolves on Government continuously to instruct and train men to handle the Machine of Civilization carefully, because the machine is being made more and more complicated, and more and more in need of intelligent care, with every passing day.

"Is this fact realized? I fear not. No sign is visible to the author of these pages that the people in any country realize or even suspect that there is any need for looking out for the integrity of the Machine as a whole. The closest approximation to it is a belated realization that the Bolsheviki are a danger to 'society.' The people do not even seem to realize the necessity of having competent experts at the head of government affairs." (p. 225.)

Furthermore, "it is a well known fact that though there are but few men in the world so wise and learned that they know much about the Machine or any of the parts, yet it is not from the wise and learned class that the great officials of government are selected." (p. 335.)

There is a despairing note in his exclamation, "*In no country is there any serious effort made to train men to operate the Machines of Government.*" (p. 229. Italics the author's.)

The ancient Athenians knew better and they examined aspirants for public office as to their qualifications.

The author may be pardoned for his remarks (p. 328) in connection with one of the many children of his fertile brain—the torpedo-plane. "During the World War, it played only a subordinate part, though it was used effectively by the British and the Germans. Our Navy did not use it at all, as Secretary Daniels rejected it." Of course he did—what else could have been expected of such a person? Still we can all sympathize with the author in his professional resentment at the stands taken by Mr. Daniels.

The reading of this exceptionally valuable and interestingly written book might well begin with the two concluding chapters which give a broad view of the whole subject and place the student in the mental attitude of the writer thus enabling him the more readily to follow the drift of the argument. That invention is indeed the main factor in progress, or according to Admiral Fiske's phrase "The Master Key," may well be admitted as proved, pacifists and transcendentalists to the contrary notwithstanding.

It will be observed that the reviewer touches very lightly upon individual inventions. Their number is so vast that all could not even have been alluded to; while to select a few and ignore the others would have been eminently unfair since no two persons are likely to agree upon the choice. The remedy is obvious. Let those interested read the whole book and each arrive at his own conclusion as to relative importance. To the naval profession the volume is highly commended. It points out the possibility of improving our own material and morale in countless ways now unappreciated and the obligation resting upon every one of us to use his eyes and his brain; the former to perceive what is needed to carry our trade still further along the road to perfection, the latter to devise the means for approaching that end. Let all naval officers, then, strive to become inventors, although, through lack of imagination, many shall fail.

Having studied Admiral Fiske's pages attentively, we are now in a position to assert that in them is revealed a hitherto unrecognized generalization which binds together as parts of one great whole all advances in art, science, government, philosophy and even religion. As the proponent of this new system are we not justified in contending that its author amply merits the title of philosopher?

C. F. G.

THE GREAT DECEPTION, by Samuel Colcord. Price \$1.50.  
(Boni and Liveright, New York.)

The intent of this book is to clear up the uncertainty in many minds to whether or not the election of Mr. Harding indicated that the people of the United States were averse to entering a League of Nations or similar organization.

As an endeavor to present a case clearly, honestly and convincingly, this little book is a model of the highest degree of excellence. It is difficult to imagine what the author could have done to make the book fulfil its declared mission more perfectly; every aspect of the situation seems to have been examined, every important fact correctly stated, every argument on both sides impartially considered.

But while one admires the heartfelt sincerity that permeates its pages, and loves its Christian kindness, and almost loves its author, a man familiar with naval and military history can hardly fail to realize that its influence must, in the main, be dangerous: not because of what it directly teaches, but of what it unconsciously suggests.

For the whole apparent inspiration to the writing of the book, the sole reason for the importance attached to it by many persons, is the virtual assumption that peace can be made permanent by mere agreement, among mere human beings.

If the book (or any other book), presented a plan, or even a suggestion, for preventing war that was even a little novel; if it outlined any scheme not tried a thousand times already; if there were any indication of an

attempt to visualize world conditions even ten years beyond the present, one would not feel so discouraged. But at this moment, when the war is hardly over, while the wails of the taxpayers are sounding in our ears—to see the same ideas advanced as caused our unpreparedness, with its resulting exorbitant expenditure of blood and money—tends to give one a hopeless feeling about our future.

This book and many similar utterances make us feel that the dead have really died in vain, that the United States will again do as she has five times done already, and drift along in unpreparedness to an inglorious war; maybe next time, to disaster.

B. A. F.



## NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-ninth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows :

### ARTICLE VII

Sec. 1. The Institute shall consist of regular life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nomination shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate mem-

ber has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

## ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, \$3.50; enlisted men, U. S. Navy, \$3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

## SPECIAL NOTICE

### NAVAL INSTITUTE PRIZE, 1923

A prize of two hundred dollars, with a gold medal and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the opposite page are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1922 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1922. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1922 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

F. M. ROBINSON,

*Lieut. Commander, U. S. N., Secretary and Treasurer.*

## TOPICS FOR ARTICLES

### SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

- The Naval Policy of the United States.
- The Navy: Its Past, Present and Future.
- The Fighting Fleet of the Future.
- Factors Governing American Naval Strength, Absolute and Relative.
- The Navy in Battle; Operations of Air, Surface and Underwater Craft.
- Escort and Defense of Oversea Military Expeditions.
- The Place of Mines in Future Naval Warfare and the Rules Which Should Govern Their Use.
- The Relation of Naval Communication to Naval Strategy.
- The Influence of Topography on Strategy.
- International Law.
- Principles on Which Should be Founded the Freedom of Neutral Shipping on the High Seas.
- The Present Rule of Neutrality Regarding Contraband and Blockade—Is It Justifiable in Ethics or in Expediency?
- What Will be the Status of the Submarine in International Law?
- Aircraft—Its Place in Naval Warfare.
- Aircraft, Practical Power of.
- Aircraft Warfare, Laws of.
- Aviation—Its Present Status and its Probable Influence on Strategy and Tactics.
- The Control of the Sea from Above.
- The Navy Air Service, Its Possibilities, Rôle and Future Development.
- The Anti-Aircraft Problem from the Navy's Viewpoint.
- Surface Craft, Future Rôle of.
- Armor or High Speed for Large Surface Vessels.
- Naval Gunnery of To-day, the Problems of Long Range and Indirect Fire.
- Mode of Design and Armament of Ships to Meet the New Conditions of Aerial and Sub-Surface Attack.
- Future Development of the Naval Shore Establishment.
- Naval Bases, Their Number, Location and Equipment.
- Strategic Requirements of the Pearl Harbor Naval Station.
- The Navy Yard as an Industrial Establishment.
- A Mobilization Program for the Future.
- Naval Organization from the Viewpoint of Liaison in Peace and War Between the Navy and the Nation.
- Organization of a Naval Communication Service.
- Scope of Naval Industrial Activity and the Navy's Relation of Naval Strength.
- Social and Industrial Conditions in Relation to the Development of Naval Strength.
- The Future of the Naval Officers' Profession.
- The Naval Officer and the Civilian.
- The Naval Officer as a Diplomat.
- The Mission of the Naval Academy in the Molding of Character.
- The Limits of Specialization in Naval Training.
- The Training of Communication Officers.

Navy Spirit—Its Value to the Service and to the Country.

Morale Building.

Military Character.

Amalgamation of the Supply Corps, Construction Corps and Civil Engineering Corps with the Line of the Navy.

The Influence of the Term of Enlistment on the Efficiency of the Service.

Shore Duty for Enlisted Men.

Physical Factors in Efficiency.

Health of Personnel in Relation to Morale.

America as a Maritime Nation.

Our New Merchant Marine.

The Adaptability of Oil Engines to all Classes of War Vessels.

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REAR ADMIRAL C. R. P. RODGERS, U. S. NAVY, JAN. 1875-JAN. 1878

COMMODORE FOXHALL A. PARKER, U. S. NAVY, JAN. 1878-JAN. 1879

REAR ADMIRAL JOHN RODGERS, U. S. NAVY, JAN. 1879-JAN. 1882

REAR ADMIRAL C. R. P. RODGERS, U. S. NAVY, JAN. 1882-JAN. 1883

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1885

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REAR ADMIRAL WM. T. SAMPSON, U. S. NAVY, OCT. 1898-OCT. 1902

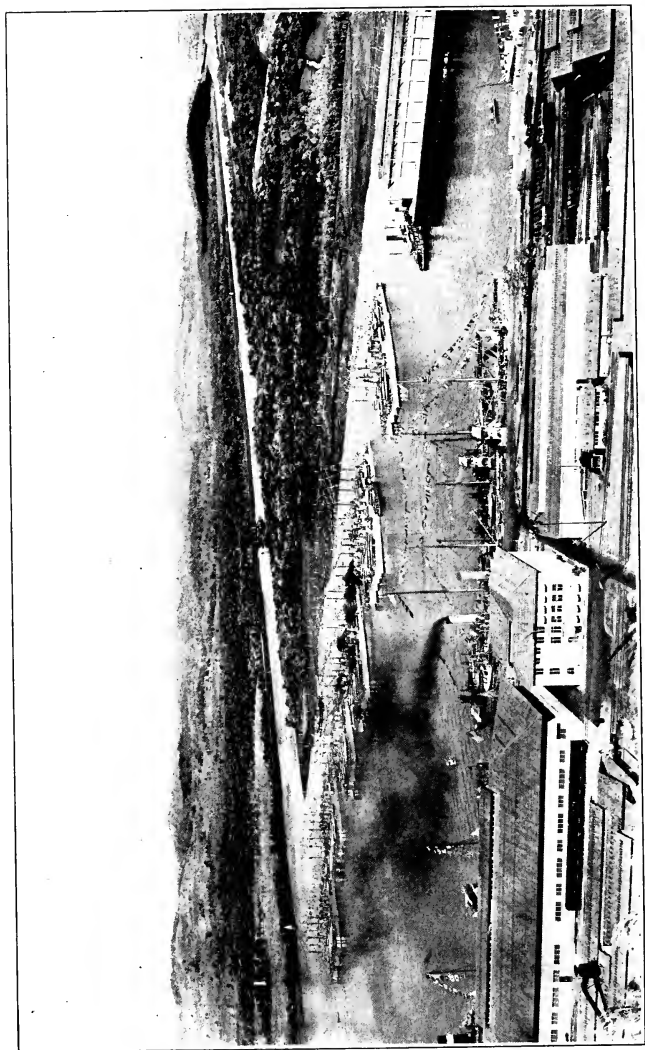
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1911





DESTROYERS AT BALBOA

# UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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## THE FUTURE OF THE SUBMARINE IN INTERNATIONAL LAW

BY MORRIS COOPER, JR.  
of the New York Bar

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The most active source of change in the rules of warfare has always been the invention of new mechanisms, new engines of destruction.

Such mechanisms, when unusual, have always been surveyed with apprehension, and, in fact, it has at times been considered a violation of the rules of military etiquette and honor, to use them. Conflans, the French vice-admiral, issued an order of the day on November 8, 1759, forbidding the use of hollow shot against the enemy, on the ground that they were not generally used by polite nations, and that the French ought to fight according to the rules of honor. The same view was taken of the use of hot shot, grape, chain-shot, split balls, etc.<sup>1</sup> The attitude of the Chinese swordsmen toward the introduction of gunpowder in the sixth century was undoubtedly similar.<sup>2</sup>

The novelty of the submarine as used by Germany in the Great War lay not in its employment against war vessels, but against merchant shipping. Before 1914 such an application of

<sup>1</sup> Halleck—*International Law*, N. Y. 1861, p. 398

<sup>2</sup> Wells—*Outline of History*, p. 556.

undersea boats, while it may have been in the minds of naval experts, had certainly never occurred to the layman. The theory expressed in the words *spurlos versenkt* was unborn.

Before the Great War the rights of belligerent and neutral merchant vessels were fairly clear. It was the duty of such vessels, if duly signalled, to lie to, and submit to visit and search. Refusal to do so was at the risk of the vessel. Capture of a belligerent merchant vessel was followed by removal to port, and an adjudication there by a prize court. To this there were certain exceptions. Under certain circumstances, such as the dangerous condition of the prize, the possibility that if released it might aid the enemy, the inability of the captor to furnish a prize crew, the distance from a national port of the captor, lack of supplies or the presence of disease, the prize might be sold or destroyed forthwith.<sup>3</sup> The crew, and the ship's papers must, however, be first removed to a place of safety so that there might be a prize court adjudication.<sup>4</sup> If any of the cargo was neutral and the vessel was sunk under the above circumstances, full compensation had to be paid to the cargo owners, and any of the crew or passengers who were neutrals had at least to be carried to a port whence they might reach their destination.

The rules of international law have never permitted the destruction of unresisting neutral merchantmen, unless the vessel is guilty of a grave act of unneutral service. The Declaration of London (Naval Conference 1908-1909) Art. 49, provided that a neutral vessel which had been captured, and which, because of its unneutral service would be liable to condemnation, might be destroyed if her removal to port would involve danger to the safety of the captor or the success of the operations in which she might be engaged at the time. The German Government used this provision as part of its defense of the practise of unrestricted submarine warfare. The exception of military necessity to the duty of taking a captured vessel to port undoubtedly gives a great advantage to a weak naval power; after the cargo has been destroyed and the witnesses dispersed the captor becomes in fact the judge of the necessity.

<sup>3</sup> *Transactions of the Grotius Society*, Vol. IV, p. xxxvi.

<sup>4</sup> Declaration of London, Article 50, German Prize Rules, 116.

Such conditions are applicable to surface craft, and operate satisfactorily when applied to such vessels. When applied to submarines they are hopelessly inadequate. The submarine is a weapon of stealth. Its power lies in its capacity to strike unseen. On the surface it is handicapped, and except for the giant boats which were constructed by Germany near the close of the Great War, are at the mercy of a fast, well-armed and efficiently-manned merchantman, particularly in a seaway. A submarine cannot possibly take aboard or remove to a place of safety the crews or passengers of vessels which it destroys. In that respect a modern cruiser is in much the same position, by reason of its construction. It may be questioned to what extent the deck or hold of a cruiser which may at any moment close with the enemy, is a "place of safety."

Thus the realization of the vast power of the submarine has brought about a situation where the old rules of maritime warfare are entirely insufficient, and it has become necessary to formulate something new to take their place. Unrestricted submarine warfare, on freight and passenger vessels alike, as practised by Germany in the Great War, must in some way be forever abolished. It is unthinkable that there should ever be another *Lusitania*.

The future of the submarine depends, of course, on the retention of the right to capture private property at sea. Today the abolition of this right seems remote, but it has been advocated from time to time.<sup>5</sup> In 1859 the chambers of commerce of Hamburg and Bremen passed the following resolution to memorialize the Congress expected to meet at Paris:

"That the inviolability of person and property in time of war, on the high seas, extended also to the subjects and citizens of belligerent states, except so far as the operations of war *necessarily* restrict the same, is imperatively demanded by the sentiments of justice universally entertained at the present day."

The capture of private property on the high seas is less objectionable than its capture on land. Such capture is generally bloodless, as most merchant vessels are incapable of resisting a man-of-war; it is an interference with a voluntary and insurable venture, not pilferage of the homes of the unfortunate inhabitants of an invaded country, and is less likely to be accompanied by

<sup>5</sup> Woolsey—*International Law*, 4th Ed., N. Y. 1877, Sec. 139.

violence and outrage. The protection of enemy commerce from molestation would rob a great naval power of most of its advantage over one with a smaller navy or none at all, as its navy would be impotent except for attack upon coast defenses.<sup>6</sup>

In 1856 the United States proposed to add to the Declaration of Paris a clause exempting all private property, except contraband, from capture on the high seas, but even this limited proposal was not adopted by the powers represented, Russia alone excepted,<sup>7</sup> and it is doubtful whether with the growth of the naval power of the United States such a suggestion would be advanced today.

Admiral Mahan, in *The Interest of America in Sea Power*, states, "It may be asserted quite confidently that the concession of immunity to what is unthinkingly called the 'private property' of an enemy on the sea, will never be conceded by a nation or alliance confident in its own sea power."

Assuming, then, that the right of capture of private property on the high seas be retained, it is quite inconceivable that a nation of comparatively weak naval power will not, *in extremis*, use the submarine to destroy the commerce which is feeding the armies of its enemies. Rules and concepts of law may seem ideal in time of peace, but unless their character is such that they will be respected and followed by *both* belligerents in time of war, they are worse than futile. Particularly in a nation which is unambitious for imperial power, and whose citizens, not seeing the possibilities of affront and consequent war, insist upon a rigidly economical naval policy, canons of maritime law which may be used as arguments for a reduction of armaments by demagogic publicists, but which would undoubtedly be broken by a ruthless enemy, are treacherous lullabies. War is bereft of sentimentality. A nation which thinks otherwise, and which believes that the rules of war which existed in the days of the frigate can withstand the pressure of modern invention, and prevail today, deceives itself woefully. Wheaton, writing in 1815, said "The object of our enquiry is not, WHAT THE LAW OUGHT TO BE, but WHAT IT PRACTICALLY IS: since it is the latter which furnishes the rule of conduct for those who

<sup>6</sup> Wheaton—*International Law*, p. 570.

<sup>7</sup> Halleck—*International Law*, 4th Ed., Ch. XXII, Sec. 2.



are governed by it. As public, unlike municipal law, is sanctioned not by the power of a single sovereign or state, but by a resort to force among independent sovereigns or states, it is necessarily imperfect in practise, however just and beautiful in theory. The law of nations is adapted to a state of war, and is intended to mitigate its violence. It is, however, frequently compelled to yield to the very violence it was designed to restrain, and becomes the victim of innovations made and enforced by the edicts of particular states and the adjudications of their tribunals. The purity and simplicity of the primitive law of nations, which is nothing more than the law of nature applied to the conduct of nations and states, has thus been corrupted.”<sup>8</sup>

It has been said that the rules of humanity are eternal and universal, and can never be broken down by scientific inventions.<sup>9</sup> How can we reconcile the laws of humanity with the hard, cold fact that a nation at war will inevitably use the most potent means that come to hand?

Various suggestions were made during the progress of the Great War, and have been made since its termination. In 1919, the Grotius Society, with membership among publicists and students of international law of many nations, appointed a committee to examine into the legal status of the submarine. The report of this committee, as published in *Transactions of the Grotius Society*, Vol. IV, 1919, suggests that the destruction of enemy merchantmen by submarines should be prohibited except in case of attempted escape or resistance, or belligerent conduct consistent only with the character of a warship. The Recommendations of the Society, based upon the committee's report, but differing somewhat from it, state that visit, search and seizure should be permitted, but prohibit destruction of enemy merchantmen “with the exceptions set out below.” No exceptions are, however, set out below or elsewhere, so far as the writer can ascertain. The Recommendations prohibit destruction of neutrals except when resisting visit and search, or engaged in blockade running, or in gross unneutral service, and provide that reasons of military necessity, such as danger to the submarine's or other warship's safety, or its operations, should not be held to justify destruction

<sup>8</sup> Wheaton—*A Digest of the Law of Maritime Captures and Prizes*.

<sup>9</sup> Garner—*International Law and the World War*, Vol. I, p. 379.

under these provisions, and furthermore, that adequate provision must be made in any case for crew and passengers.

Professor Garner reaches similar conclusions. After discussing the necessity of removal of crew and passengers to a place of safety before the destruction of a vessel he states that "Since submarines in the present state of development do not possess such facilities, they should be prohibited absolutely from attacking merchant vessels, except in case of attempted escape or resistance. No distinction should be recognized between the obligations of submarine commanders and the commanders of cruisers to provide for the safety of crews and passengers and this should be definitely affirmed by the new international law."<sup>10</sup>

To hope that nations will abide by any such rules is a fantastic dream. Approach an angry bull with a red flag; wave it in his eyes; then call his attention to several books containing very definite rules for his conduct.

The utter futility of the idea that nations will make war only "in a mild and mitigated fashion, after due notice and according to an approved set of regulations" has been admirably pointed out by Mr. H. G. Wells.<sup>11</sup> If we are to have new rules to govern new conditions, let us at least try to formulate rules which we may hope to see survive a bitter combat.

Modern wars are fought, not only by mercenaries and volunteers, but by entire populations. Even if not actually in the field, every soul in the nation is affected more or less closely by a great war. The officers and crews of merchant vessels are normally drawn from citizens of the nation whose flag they fly. If they are not citizens they receive the benefits of such and may also be said to assume the risks. They are ordinarily of military age, accustomed to hardship and to privation. If not engaged in manning merchant ships, an occupation vital to the prosecution of any war by a seafaring nation, the nationals among them would undoubtedly be subject to conscription into the regular military service.

Why should we so jealously guard the safety of merchant crews? It is perfectly practicable to arm merchantmen with guns up to 6 inches, and to man them with naval gun crews for defense

<sup>10</sup> Garner—*International Law and the World War*, Vol. 2, pp. 456-7.

<sup>11</sup> Article in *The World* (N. Y.) Nov. 9, 1921.

against submarines. Why then, should we not permit belligerent merchant vessels, *carrying freight only*, to arm against submarines, not only for defense, but also for offense, allowing either the submarine or the ship to attack without search or warning? Of course the construction and armament of the merchantman will prevent her from attacking war vessels other than submarines, and as to such other war vessels the prevailing rules as to visit, search and seizure should still prevail.

On the other hand, *non-combatant passengers* should be entirely free from capture or molestation. Certain ships should be selected, to be used only for the carriage of passengers, and to carry no freight whatsoever, using ballast if necessary, and no passengers should be permitted to travel on freight vessels. Doing so should be entirely at their own risk. Such passenger vessels should have precisely the same status as hospital ships, and should be subject to the same restrictions. The names of such ships should be communicated to the belligerents before their employment, and they should be painted in a distinctive manner and have some device for disclosing their identity at night. They should be unarmed, even for defense, and sinking them should be made the most serious of war crimes. To protect against the transportation of combatants an inspection of the passengers before sailing might well be made by the neutral consul in charge of the affairs of the belligerent.

The problem of neutral vessels remains. As far as neutral passenger ships are concerned, the provision for belligerent passengers could be made equally applicable to neutral passenger vessels and would afford greater protection than has in the past usually been accorded to neutrals passing through a war zone. In respect to vessels carrying only neutral freight destined for belligerent territory, it may be that we have been in the past too solicitous of the rights of neutral traders. The spectacle of the profiteers in a neutral nation waxing fat in furnishing the means for a death struggle between other nations is loathsome.

In the days before steam, wireless telegraphy and aircraft, the blockade, in spite of the elaborate restrictions upon its use, was a serious impediment to neutral shipping. Now that the blockade because of these and other inventions is almost obsolete, the submarine has become its natural substitute.

As a practical matter, it is well-nigh impossible for any nation to be entirely neutral. Alliances, ententes and understandings nullify the theory of neutrality. Furthermore, citizens of neutral nations consciously or unconsciously encourage war in the hope of stimulation of trade and exorbitant profits.

We are thus forced to the conclusion that if neutrals wish to trade with belligerents, they should take the chance of such trade. If the rules for neutral and belligerent freight vessels differ, the temptation to use false colors is enormous, and making their use a war crime, as suggested by the Grotius Society (*Transactions of the Grotius Society*, Vol. IV, p. xliii) will not prevent it. We must assume that in time of stress, other nations may adopt the same submarine policy as was adopted by Germany during the Great War and neutrals should look forward to this contingency, and in so far as possible be prepared to meet it. It is urged, therefore, that the submarine be allowed to attack neutral merchant freight ships proceeding into a defined war zone indiscriminately, and that such ships be permitted to arm for defense against submarines. A neutral nation expecting to trade with a belligerent, if it does not wish to arm its own ships, should apply to such belligerent for protection. Defense against submarines by such vessels, on the other hand, should not be construed as an act of war on the part of the neutral and the officers and crews if captured should be unconditionally released.

It may be urged that a rule such as the foregoing as to neutral shipping will tend to draw all maritime nations into any war involving one of them. If this is true and if all nations fully realize what their position as neutrals will be, such a rule should act as a preventive of war as neutrals will be inclined to throw their entire influence against war rather than to encourage it.

In this discussion a sharp distinction has been drawn between passenger vessels and freight vessels and it must be emphasized that passenger vessels must carry only passengers and perhaps first class mail. Their holds if not used for passengers must be light or filled with ballast. That this will make the cost of passenger traffic high is realized, but the privilege of transportation in war time is an unusual one and must always be costly.

The principal crime of the submarine in the Great War was its use against passenger vessels. The temptation to this crime lay

not in the fact that these vessels carried passengers, but in that they also carried supplies which sustained the belligerents, and, in some cases, arms and ammunition. If this temptation be removed the crime will also disappear.

#### ADDENDA

Since writing the foregoing the rules proposed by Mr. Elihu Root, chairman of the sub-committee of the Arms Conference for drafting resolutions regarding submarines, have been accepted on behalf of the five chief naval powers. They are subject to the same criticism as those of the Grotius Society and of Professor Garner. Furthermore, they are so indefinite in their purport as to lead to endless confusion and wrangling. The resolutions are as follows:

"Section I. The signatory powers declare that among the rules adopted by civilized nations for the protection of the lives of neutrals and non-combatants at sea in time of war the following are to be deemed an established part of international law:

"(1) A merchant vessel must be ordered to submit to visit and search to determine its character before it can be seized.

"A merchant vessel must not be attacked unless it refuses to submit to visit and search after warning, or to proceed as directed after seizure.

"A merchant vessel must not be destroyed unless the crew and passengers have been first placed in safety.

"(2) Belligerent submarines are not under any circumstances exempt from the universal rules above stated, and if a submarine cannot capture a merchant vessel in conformity with these rules, the existing law of nations requires it to desist from attack and from seizure and to permit the merchant vessel to proceed unmolested.

"Section II. The signatory powers invite all other civilized powers to express their assent to the foregoing statement of established law so that there may be a clear public understanding throughout the world of the standards of conduct by which the public opinion of the world is to pass judgment upon future belligerents.

"Section III. The signatory powers desiring to insure the enforcement of the humane rules of existing law declared by them

with respect to attacks upon and the seizure and destruction of merchant ships, further declare that any person in the service of any power who shall violate any of these rules, whether or not such person is under orders of a Governmental superior, shall be deemed to have violated the laws of war and shall be liable to trial and punishment as if for an act of piracy and may be brought to trial before the civil or military authorities of any power within the jurisdiction of which he may be found.

"Section IV. The signatory powers recognize the practical impossibility of using submarines as commerce destroyers without violating, as they were violated in the war of 1914-1918, the requirements universally accepted by civilized nations for the protection of the lives of neutrals and non-combatants, and to the end that the prohibition of the use of submarines as commerce destroyers shall be universally accepted as a part of the law of nations, they now accept that prohibition as henceforth binding as between themselves, and they invite all other nations to adhere thereto."

Mr. Root fails, however, to define a merchant vessel. What will prevent a vessel, to all appearances a cargo carrier, from engaging in the most unneutral service, or even actually in belligerent naval operations? Already the question has provoked various definitions among the powers. When does a merchant vessel become a warship? It is rumored that the Italians maintain that a merchantman in this connection must be considered as a vessel not armed and not carrying contraband of war; that the British assume that a merchantman is a ship which carries freight or passengers which are not the property of the state and which is itself privately owned, and that unquestionably such a vessel has the right to arm for defensive purposes and to carry munitions; that the French decline to commit themselves at all. The United States is also non-committal. And supposing the altogether improbable, that all nations come to an agreement as to just what cargo and service render an apparent merchant ship a warship, how is the submarine commander to know? Mr. Root has merely repeated the old phrases; he has altogether overlooked the new mechanical situation; he, like Admiral Conflans, tells us that the submarine is not used by polite nations, and that we should fight according to the rules of honor.

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## MILITARY CONSERVATISM

ADDRESS BY REAR ADMIRAL WM. S. SIMS, U. S. N.,  
*President U. S. Naval War College,*  
19 November, 1921

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### TO THE GRADUATING CLASS OF 1921

In bidding good-bye to the members of the class of 1921, at the termination of their course of one year at the Naval War College, it has occurred to me that it may be of some interest to invite their consideration of a subject to which too little attention has heretofore been paid, namely, that type and degree of military conservatism which has so often been responsible for defeat in battle, and sometimes for national disaster.

Ever since men first began to use weapons to fight each other, military men have been reproached for excessive conservatism, a polite term often intended to imply a dangerous class reluctance to accept new ideas.

All men are naturally more or less conservative; certainly all civil professions are decidedly so; but they can afford to be without much danger to the country, whereas, in the case of the military profession, national disaster might easily result from a lack of the vision necessary to recognize the superiority of a new weapon or a new method of warfare.

That military men are conservative admits of no doubt. Whether they are more so than civilians is beside the question. The important point is that their conservatism may be so dangerous that it is highly important that they should so train their minds in logical thinking as to eliminate, or at least minimize, this danger.

We hope that the training at the Naval War College will have this effect; and I believe that it will, provided our understanding

of the influence of conservatism in the past is such as to convince us that we must avoid its danger in future. With this end in view it will be useful to invite attention to certain instances of this defect that are recorded in the history of warfare, and also to certain recent instances that will show the influence it has exerted, and perhaps is still exerting, upon the minds of our contemporaries. These latter illustrations will include a number of instances that are within my own experience, and doubtless some of these are within your recollection; and from them we may be able to determine the cause of the state of mind in question, and possibly to indicate the remedy.

So strong has been the resistance to the general introduction of any new weapons or methods of warfare that one is almost forced to conclude that the military classes of all ages were all recruited from the Missouri of their respective countries. However this may be, it may be stated in general terms that most arguments in favor of fundamentally new weapons have failed except those that resulted in shedding the blood of the unbelievers; that defeat alone has been accepted as a final demonstration. The following are a few examples of the nature of the resistance in question, beginning with ancient times in order to show that this influence has been continuous, and that such conservatism as we retain at present is a legitimate inheritance from our naval forebears:

Considering, first, the most primitive weapons, there is no doubt but that the bow was a vastly more efficient instrument of warfare than the sword, the mace, or the pike; but almost without exception it was never accepted as a proper arm for the knight or warrior. The ancient wars were mainly fought with the sword and javelin, and both Greeks and Romans looked upon the bow as plebeian. It was not until the decline of the Roman Empire that the bow was used to any large degree by the Romans, the victory over the Franks at Casilinum (A. D. 554) being won by the horse-archers.

The warriors of medieval Europe viewed the bow in the same way. Thus Charlemagne endeavored to dignify and extend its use by edicts and the establishment of schools of archery, but to little avail, for the bow remained, until supplanted by firearms, the arm of the inferior classes and the yeomanry.



The cross-bow was an advance over the bow in power and efficiency but it never became the predominant arm, although it was extensively used during the Crusades. In A. D. 1139, the Lateran Council condemned its use as a murderous weapon. This resulted in a partial abandonment of it as a mode of warfare. The attitude of the nobleman respecting the cross-bow is indicated by the action of Philip of France at the battle of Crécy (August 26, 1346), who rode down his Genoese cross-bowmen with the words, "Forward and strike down this useless rabble, who are thus blocking up the way in our front." But Crécy was won by bowmen, the English archers, who, unlike the Genoese, had kept their bow-strings dry, devastating the chivalry of France.

"A first-class English archer," said Prince Louis Napoleon, "who in a single minute was able to draw and discharge his bow twelve times with a range of 240 yards, and who in these twelve shots only once missed his man, was very lightly esteemed."

It would seem that there was for many centuries a settled prejudice against projectiles, or perhaps rather against the men who launched the projectiles, because it was considered that these men required less courage than the wielders of short-arm weapons. This prejudice persisted for a considerable period even after the introduction of firearms.

Although gunpowder is said to have been discovered in Europe by Roger Bacon during the early years of the 13th century, it was not until 1338 that we have any account of the use of artillery. This was at the battle of Cambrai. Cannon are again mentioned as used in the battle of Quesnoy (1339). At this time, however, they were looked upon as curiosities more than anything else, and it was the general opinion of military experts that artillery would not supplant the sword and the pike.

In fact the pike or the lance was considered superior to the gun as late as the 18th century. We know that the Emperor of Germany changed his pikemen to musketeers in 1689, which led Louvois, the French minister, to propose a similar change in the armies of France. Louis XIV, however, while he confessed that he was impressed by the minister's arguments, said that he did not consider them strong enough to warrant such a great change. Pikes were not abolished in France until 1703. Incidentally, they were still supplied to our ships 180 years later.

Nor was our cloth less conservative as regards the introduction either of weapons or of methods of propelling war vessels. For example, it is apparent that oars were used more than sails in the sea battles of the ancients. The sail was mainly an auxiliary. The Egyptians, the Romans and the Greeks all trusted to the oar on account of its freedom from weather conditions. This attitude persisted quite to modern times; the battle of Lepanto (1499) was fought with galleys, and the Spanish Armada (1588) contained a great number of galleys. Artillery did more to do away with the oar than anything else, for the guns occupied the positions of the oarsmen.

Also Mahan states in *From Sail to Steam*, that: "The parting with sails as the motive reliance of a ship of war was characterized by an extreme conservatism. Steam was accepted first as an auxiliary, for towing, etc. A man of unusual intelligence maintained that steam would never prevail over sail; the steamer 'broke down,' and owing to the fuel question could never be as self-contained as a sailing ship. Admiral Baudin, a Napoleonic veteran, was very sarcastic over the uncertainty of steamers."

And Wilmot, in his book *The Development of Navies*, states that: "In England we were disposed to rely on what had in former years admirably answered the purpose, and given us supremacy on the sea by which the security of the country was ensured. Had our fleet suffered defeat, we might have been more ready to adopt new inventions, indeed, to initiate them, rather than wait until their utility was proven by others."

Barnaby, in his *Naval Developments of the Century*, shows the extreme reluctance of those in authority even to consider the adoption of new weapons. He states that: "This demand of the fighting man for the most perfect weapons throughout the entire armoury, however often the change may be necessary, has a curious effect upon the good Admiralty and War Office official. He does not hesitate to take up an attitude of hostility to all innovation and to do his best to suppress it. Sad experience as to what advancing tides will do is perhaps working changes in the official mind, but the author well remembers the authority and seriousness with which the doctrine was held fifty years ago."

Wilmot again states that: "The discovery that steam could be profitably utilized for the propulsion of ships, and the tardy

adoption of the screw, did not for many years materially affect the construction of war vessels. There was a strong prejudice to overcome in the minds of those who retained a vivid recollection of the glories accomplished in the past under sail, and who had a natural love for the art in which we excelled. Rear Admiral Sir William Symonds (director of naval construction), to whom I have alluded as effecting considerable improvement in the qualities of our sailing ships, had, as his biographer states, no love for steamers in any shape. . . . In a letter to Lord Auckland . . . he states: 'I consider steamers of every description in the greatest peril when it is necessary to use broadside guns in close action; not alone from their liability to be disabled from shot striking their steam-chest, steam-pipe, machinery, etc., but great probability of explosion owing to sparks from funnel.' "

His opposition was so great that he was forced to resign in favor of a committee of naval architects, under Sir Baldwin Walker, "a naval officer distinguished for his seamanship;" but this officer's distinction in this respect was such that progress under his control is described as follows by a British historian:

"The naval members of the Board of Admiralty were men who had long looked upon the noble line-of-battle-ships of the navy as not to be surpassed, and they could not apparently make up their minds to desecrate them, as they seemed to consider it, by the introduction of steam power. The result of this somewhat romantic feeling was, that early in Sir Baldwin Walker's administration a number of sailing three-deckers were laid down, in opposition to the expressed opinion of the leading civil professional officers attached to the Admiralty. Not one of these vessels, as had been predicted, was ever launched as a sailing vessel. They were converted into screw ships by being lengthened in midships, at the bows, and also at the sterns. The greater proportion of the other sailing three-deckers were also cut down and converted into two-decked screw ships, their sterns only being altered."

Inventors have always had a hard time in convincing high naval officials of the merits of their inventions. It usually required the pressure of war necessity or strong political influence, or both, to insure even a hearing. Fulton and Ericsson are cases in point.

Fulton's *Demologos*, a steam-propelled floating battery, contained all the elements essential for a battleship today—positive and well-

protected motive power, heavy battery, and impregnable armor, the latter five feet of solid wood; but naval officers insisted upon masts and sails and heavy bulwarks to protect those handling them. "Thus, on the first possible occasion, did steam and sail power come into conflict, and steam had to take the inferior position."

In 1837-38 Ericsson was unable to gain recognition from the Admiralty, and in 1839 he returned to America and, under the patronage of Captain Stockton, one of the few officers who favored the use of steam, superintended in 1842 the building of the sloop-of-war *Princeton*, the first screw steam vessel of war built in any country.

In the fifties Congress ordered the building of "six first-class steam frigates." They were full-rigged ships but with steam power so ridiculously small as to call forth the following comment from the Late Rear Admiral Edward Simpson:

"There were those at that time who, wise beyond their generation, recognized the full meaning of the advent of steam, and saw that it must supplant sails altogether as a motive power for ships. These advocated that new construction should be provided with full steam power, with sails as an auxiliary; but the old pride in the sailing-ship, with her taut and graceful spars, could not be made to yield at once to the innovation; old traditions pointing to the necessity of full sail power could not be dispelled; it was considered a sufficient concession to admit steam on any terms, and thus the conservative and temporizing course was adopted of retaining full sail power, and utilizing steam as an auxiliary."

Barnaby states that: "There was the same prejudice against the adoption of iron for vessels as for the adoption of steam propulsion. Furthermore the opponents of armor were sufficiently entrenched to delay the adoption of these new ideas for years. Iron was first used in vessels in 1812, but it was not until 1834 that the British Admiralty began to make experiments in this field, and not until 1845 that an armored ship was produced by Laird."

The introduction of armor was opposed very strenuously for many years. Barnaby further states that: "In 1876 Admiral Sir George Elliott circulated a pamphlet designed 'to stop the useless expenditure by the Admiralty of vast sums of money on the ships ordered by them not because the ships were partially unarmoured,

but because they were armoured at all. In that pamphlet he declared armour-clad ship-building to be the result of want of foresight. . . . But he contended that the evidence of the superiority of the gun, and the developments of the efficacy of the ram and the torpedo had deprived us of sufficient excuse of late years to continue to fight the losing game of armour against guns."

"The great naval tactician, Sir Howard Douglas, in 1858, published a book entitled *Naval Warfare With Steam* in which he said that the *Renown* was the best type of war vessel in the British navy. This vessel was unarmoured."

In comparatively recent times we have seen wide fluctuations of opinion as to the relative importance of armor and volume of gun-fire, including Farragut's unfortunate phrase, "The best protection against the enemy's fire is a well-directed fire from our own guns."

This phrase had a profound influence upon the design of ships in certain navies. The Russian cruisers of the *Gromoboi* class were equipped with a battery so heavy for their displacement and speed that not only were many guns left without armor but the personnel of her ammunition supply was so exposed that she fell an easy prey to a Japanese vessel of the *Asama* class, with half the number of guns all adequately protected.

The long and costly controversy over the adoption of breech-loading guns is too well known to require reference to more than the very significant fact that purely mechanical difficulties were constantly allowed to overshadow in importance the fundamental principle involved. Breech-loaders were installed in the British navy, replaced by muzzle-loaders, and reinstalled until their final adoption in the latter part of the 19th century. Thus Barnaby states:

"In 1875, owing to accidents to breech-loaders, the muzzle-loader was reinstated in the service. The great munitions firm of Armstrong fought the breech-loader for years and was instrumental in deferring its adoption. The firm, of course, was supported by many naval officers."

"The breech-loading guns might have been retained for all they were worth, and in course of time men would have become familiarized with them. Defects and weaknesses would have been soberly valued and gradually removed. . . . We had to

pay heavily for that and we are called upon now to reverse the process and get rid of all ships having a muzzle-loading armament."

But while ordnance experts were vigorously discussing the question as to the end of the gun into which the projectile would best be inserted, and were still blind to the profound influence the breech-loader necessarily would exercise upon the design of war vessels, they were no less strenuously resisting any improvements in the projectiles themselves. Some of their arguments are curious, and some amusing, particularly those concerning the great cost of the shell of that day. Thus Wilmot states that:

"The old prejudice in favor of solid shot was not easily overcome. The latter were said to be more accurate, and to have greater range and penetration than hollow shell. Objections were also raised to putting too many shell guns in ships on account of the danger of accidental explosions.

"Another argument used against the introduction of projectiles was their cost. Sir Howard Douglas, in his work on *Naval Gunnery* says, 'the expense of shell equipment is enormous. The cost of every 8-inch shell in box is 11 s. 6 d., or \$2.78, and each one fired costs 17 s. 4¾ d., or \$4.17. (1838).'

Having in the above account convicted the officers who were before our time of a degree of conservatism that was at least very dangerous to the success of their navies, the question arises as to whether the record of our contemporaries is any better. It is to a certain extent, because during the last fifty years we have become so accustomed to great advances in all mechanical appliances and scientific processes that it is hard to surprise us by anything new in these lines.

During the lifetime of officers still living it may be said that navies have advanced from wood and sails to steel and steam. Some of our senior admirals began their careers on full rigged wooden vessels with feeble auxiliary steam power and smooth bore guns.

During a visit I made to the Portsmouth dockyard in 1905, the first dreadnought was anchored in the harbor alongside Nelson's *Victory*, and the admiral in command of the yard invited attention to the enormous progress that had been made since he began his career as a middy when vessels of the *Victory* type were still standard capital ships.

This rapid progress has of course tended to diminish conservatism as much in foreign navies as in ours; but the important question now is as to whether the training we are actually giving our officers in systematic and logical thinking will enable our navy, not simply to adopt improvements after their value has been proved in foreign navies, but so to utilize our undoubted inventive ability, and so promptly to recognize demonstrated facts, that we may keep safely in the van of progress, and thus eliminate the danger of being outclassed through the superior vision and alertness of possible enemies.

In this connection it may be useful to invite attention to two very significant facts:

First, that America has been distinctly in the lead in originating many important features of naval design, and in the invention of types and weapons of fundamental importance I need cite as examples only the monitor, the submarine and the airplane. There are many others.

Second, that, generally speaking, our navy has lagged behind in the adoption and general application even of our own American improvements and inventions. Many of our inventors have had to go abroad for recognition.

This indisposition on the part of our navy at once to utilize new ideas, weapons and methods of demonstrated value is a fact of supreme importance. In fact it is the gist of this whole subject. It is due to a habit of mind that could be indulged in the past with comparative safety, but which is manifestly a danger to a country that has become involved in international politics, and whose policies are likely to be disputed by other powers.

This habit of mind was not the result of a lack of intelligence or patriotic interest, but was due chiefly to the long period during which our country was relatively free from foreign entanglements, and, consequently, when we so lacked the pressure of the probability of war that is continuously felt by European nations, that we naturally thought we could afford to let other navies experiment with, and demonstrate the usefulness of, new designs and weapons before we adopted them. We can no longer safely do so. In order fully to realize the extent to which at times we have been unprogressive it will be necessary briefly to review our attitude in the immediate past, and thus show why we must, and perhaps how we can, avoid this danger in future.

Almost all controversies over questions of the adoption of new methods or weapons have had one perfectly natural feature in common: they have been contests between the younger men with their naturally more progressive minds and the more conservative seniors at the top of the list who had the power of decision. This has been as true in former times as it has been in our time; and moreover, it goes without saying that while in general such controversies have been based upon honest differences of opinion, sometimes strongly influenced by natural conservatism, still they were not free from the influences of our fallible human nature.

Criticisms from juniors fall with great severity upon the responsible seniors, especially in a military service; and questions of personal ambition, and the assumed necessity of defending established reputations, both of men and of organizations, do not create a condition of mind that is favorable to the reception of new ideas. The consequence too often has been successful resistance on the part of responsible naval officials, sometimes continued until overcome by the civil authorities or by the force of public opinion.

It is doubtless well known to all of you that in the past our navy vigorously resisted the introduction of steam propulsion, then reluctantly consented to auxiliary steam with full sail power, then to full steam with auxiliary sail power, and finally, but very tardily, gave up sails altogether. There was the same opposition to the introduction of armor, breech-loading guns, and other improvements of minor importance; and nothing but the extreme pressure of war necessity overcame the opposition to Ericsson's monitor. It is not necessary to review all of these phases of our navy's resistance, as they were similar in all respects to those already noted in the experience of the British and other navies; but it should be recorded that these controversies were fought out in some instances not only with extreme bitterness but with an apparent inability or indisposition to accept the plainest possible evidence.

This was not simply conservatism, it was conservatism complicated not only by national conceit, but by personal interests and human passions, and too often, by a certain degree of dishonesty exhibited in the defense of reputations.



In order to accentuate the military necessity of logical ability and intellectual honesty in reaching decisions that may be vital to the efficiency of military forces, I will review briefly the kind and degree of opposition that had to be overcome in order to accomplish the general adoption only of the most important of all modern improvements, namely, the new methods of gunnery training, the all-big-gun capital ship, and the submarine.

These improvements are probably within the experience of all officers present, but I think it is doubtful whether many of you are aware that there was much opposition to their adoption, and still more doubtful that you are informed of its nature or intensity. The extent of this opposition is hereinafter described for the sole purpose of inviting attention to the errors in this respect that we seek to avoid in future. That such errors must hereafter be avoided is apparent from the fact that in all three of the cases just cited—gunnery training, the dreadnought type of design, and the submarine—our resistance left us so far behind other navies that if war had been declared before we had adopted such fundamental improvements we would, in all probability, have suffered defeat in consequence.

As regards efficiency in gunnery it would seem that the naval mind has always been particularly self-satisfied. Even an officer of such vision as Nelson, when asked to grant an interview to an inventor of an improved method of aiming the guns of a ship of the line, consented to receive him but said he did not expect to live to see the day when it would be necessary accurately to aim these guns, as he always expected to engage the enemy within pistol range.

The risk that the British navy ran becomes apparent when we consider that the effective range of the guns of the period was about 3,000 yards, particularly against the enemy's rigging; that simple mechanism for pointing the guns was easily realizable; and the slow approach, for example, at Trafalgar, would have permitted the enemy to fire ten or twelve broadsides before the British ships closed to the range at which they could hit without aiming.

In 1895, while serving as intelligence officer of a vessel on the China Station, I made reports upon some sixty odd foreign men-

of-war. These included a description of a new cruiser of the *Edgar* class, and of the British so-called "H" sight, and an account of the, at that time, quite extraordinary number of hits-per-gun-per-minute made by the *Edgar's* 6-inch guns fitted with these sights. These results were so far in advance of ours that the reports were probably not believed. At all events not only was no attention paid to them at the Navy Department, but they were considered of so little value that they were all destroyed.

During the four years from the beginning of 1897 until the latter part of 1900, I made from France and Russia extensive reports on the gunnery training of the French and Russian navies. France was at that time firing at relatively long ranges; the Russian training, though largely mistaken in principle, was probably the most complete and extensive of that of any navy, and her expenditure of ammunition was by far the greatest. Reports on ordnance, construction, and so forth, during this period showed a great superiority of design over the astonishing inefficiency of our contemporary ships. In all, these reports comprised over eleven thousand pages. They produced no appreciable effect at the time, and were not only destroyed but the letter-press copies in Paris were burned by order of the Navy Department.

In 1901 and 1902 many reports were submitted from China on the design of foreign ships, their systems of protection, ordnance mechanism, methods of gunnery training, and so forth. These included a comparison showing that notwithstanding the relative weight of armor carried by the *Kentucky* class, then just commissioned and the pride of our navy, their turret and broadside guns were greatly exposed, and even their magazines were so open as to render it very dangerous to fire the guns. This report attracted some attention at the Navy Department. It promptly disappeared and was never thereafter located; and the defects to which it invited attention were defended up to, and even after, the fearful turret accidents that caused the death of so many officers and men in the turret explosions in the *Missouri*, *Kearsarge*, *Georgia* and other vessels.

During the same period extensive reports were made upon Captain Sir Percy Scott's method of training gunpointers by means of the dotter. Not only were the records made at Scott's target practices disputed, but the most fundamentally important improve-

ment recorded in the history of naval artillery, that is, the continuous aim that enables us to hit at long ranges, and which has consequently profoundly modified the design of war vessels, was not only ridiculed as absurd, but it was officially "proved" to be so by an elaborate paper prepared by the Bureau of Ordnance to show that it was mathematically impossible for a pointer to keep a six-inch gun on a target throughout a roll of even a few degrees.

All the reports just mentioned that were submitted from China were destroyed. The effort to secure the adoption by the Navy Department of the improvements in question was at the time a flat failure, notwithstanding the fact that the commander-in-chief of the China Station, Admiral Remey, brought them to the attention of the Navy Department in special communications, in which he stated that the situation was extremely critical as regarded the design of our vessels, the mechanism of our ordnance, and the training of our gunnery personnel.

The new system of gunnery training and fire-control was at that time opposed by the great majority of our senior officers, many of whom expressed their disapproval in letters to the Department advocating the retention of our former practice of requiring each gun-pointer to estimate the range and control the fire of his own gun. This opposition produced an order requiring that all men, including mess attendants, should frequently be exercised at estimating distances.

Subsequently, our inefficiency in gunnery was brought directly to the attention of President Roosevelt, who issued peremptory orders that the new methods of training should at once be put in practice and that all guns should be fitted with efficient sights. Under this order, our marksmanship developed with great rapidity, though the system of training was still opposed by practically all of the senior officers concerned, including, for example, all but one of the captains of the North Atlantic fleet.

When in 1903 and 1904, this development had demonstrated the accuracy of heavy turret guns at distances beyond the effective range of the secondary battery, and when, in consequence, a number of our junior officers opposed the building of any more mixed caliber ships and recommended the all big-gun ship, or dreadnought type, the recommendation was successfully opposed by most of our senior officers, including Admiral Mahan, until its

adoption was forced by President Roosevelt. But for this conservative attitude we would have launched the first dreadnought. A painting in my possession of the design recommended is dated 1904.

Many of you may remember that this opposition was based chiefly upon the Department's official opinion that the greater the calibre of the gun the less its ability to hit; also upon the singular opinion implied by the phrase "the smothering effect of the fire of the small secondary battery guns"—a phrase without meaning when applied to the fire of such small guns against battleship armor, but, nevertheless, tenaciously believed in for many years by some of our leading authorities—a striking example of the peculiar power of a picturesque phrase when substituted for the careful reasoning that is of such vital importance in military matters.

In the case of all the vitally important improvements indicated, we have followed instead of leading. Sometimes we have not even followed though outclassed by new types in all important navies. All competent students of naval warfare have long since recognized the necessity for battle cruisers, particularly if our possible enemies possess them; but until recently our navy has failed to recommend them to the Congress, though for a great many years their value has been conclusively demonstrated on the game board.

The case of the submarine need be hardly more than mentioned. Though American designers of this type of vessel are responsible for most of the principles upon which its success depends, they received so little encouragement from our navy that not only was the first practical development in foreign navies, but even as late as our entry into the Great War, the capabilities of this type of vessel were seriously misunderstood.

The same is true to an even greater degree as regards the development of the airplane as a weapon. Even while foreign countries were appropriating large sums of money and were making every effort to develop it, our naval authorities were actually resisting its introduction.

These are only a few of the instances of the deadly effect of unreasoning conservatism. Many others could be cited in connection with practically every more or less radical departure in

design, weapons, methods or appliances. Generally speaking, all such improvements have met with more or less effective resistance from those in authority; and the examples cited show that this resistance has been in certain important cases so very determined as to cause juniors to think twice before placing themselves definitely in opposition to their seniors; and it should be specially noted that the more important or fundamental the improvement advocated, the more strenuous and prolonged is likely to be the opposition, and consequently, the greater the danger of delay in giving it impartial and unprejudiced consideration.

It is by reason of this attitude that our navy found itself so absurdly deficient in marksmanship during the Spanish war; so deficient in destroyers, submarines and airplanes when we entered the Great War; and it is for this reason that we are still without battle cruisers.

The rapid development of the submarine and the airplane during the war, and the continuous development of both, and especially the latter, since the war, have shown that these powerful weapons are still in their infancy; that great possibilities of development are clearly in sight; and that it will require the most careful, devoted, and logical consideration upon our part even to keep abreast of the developments in foreign navies, much less to anticipate these developments.

Are we approaching the consideration of the influence of these revolutionary weapons in a judicial frame of mind? I am afraid not, in view of recent examples of minds absolutely closed to the plainest facts. In spite of adequate experiments clearly showing that airplanes could make a certain percentage of hits upon ship targets, a secretary of the navy expressed his disbelief in the ability of bombing planes to injure a vessel by affirming his willingness to stand upon the bridge of the *Ostfriesland* during the proposed bombing experiments. It is of course not remarkable that a civilian should have made such a statement; but it is very significant that this statement was based upon similar statements by naval officers and upon the assurance of naval advisers who were suffering the blighting influence of conservatism to an extent not exceeded by that of any of the examples just cited from history and from recent experiences.

So great indeed was the unwillingness to admit anything at all to the disadvantage of the battleship that many of our senior officers solved the difficulty for themselves by simply denying all the claims made by the airmen. For example, a captain on duty at the Navy Department expressed the opinion that a battleship can shoot down planes as fast as they attempt to get into bombing position; that even unopposed bombers could not hit a vessel underway; and in any case that bombs would not do much damage; that a bomb exploding on the protective deck would not penetrate below if it contained less than three thousand pounds of T.N.T.

Manifestly, our mental attitude in these matters must be radically changed unless we are to repeat the errors of the past, and cause our navy to follow instead of leading.

Verily, we must be on our guard against the dangers of a lack of vision and of a lack of confidence in the conclusions derived from a candid and logical examination of the significance of established military facts.

Our objective must not be "*safety first*" in the sense of adherence to already tested practices and implements, but safety first in being the first to recognize, the first to experiment with, and the first to adopt improvements of distinct military value.

Doubtless many of us have suffered from pain of a new idea, and some have recorded their suffering in writing. I remember ridiculing many years ago an imaginative article, describing a naval battle of the future, because the author had ships destroying each other by gunfire at 12,000 yards; and I am consoled only by the fact that many of my seniors inveighed at the time against the absurd idea that naval actions would ever be fought at "the enormous range of 7,000 yards."

Our navy has in our own time passed through periods of great danger. At the battle of Santiago we made but three per cent of hits at ranges shorter than are ever likely to occur again; and so inefficient was our gunnery up to 1900 that an equal force of ships of any efficient navy could have inflicted upon us a most humiliating defeat.

In my opinion we are now entering a period that may become still more dangerous if we fail correctly to interpret the significance of the rapid development of fundamentally new weapons of

enormous destructive power and of relative immunity to effective resistance by any means except a decisive superiority of similar weapons.

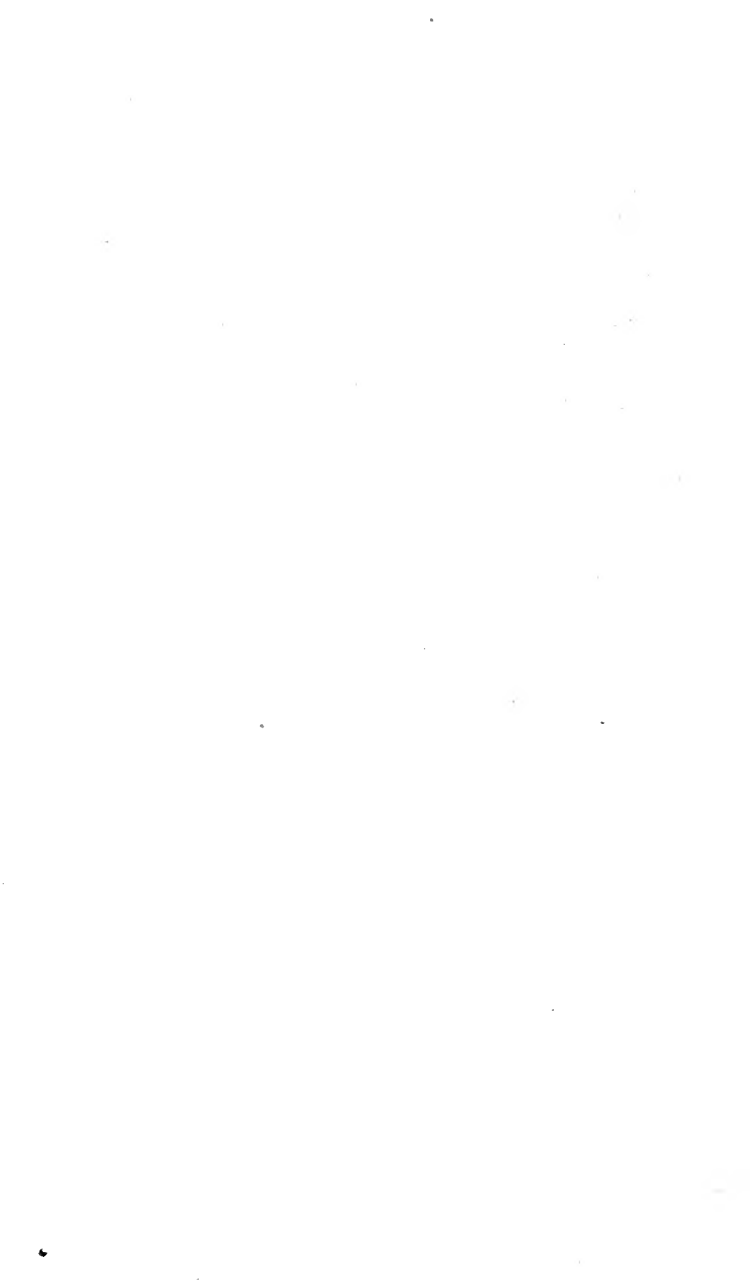
We may escape this danger in future, as has so often been the case in the past, through the superior vision of a Roosevelt, or through the pressure of public opinion, overcoming the excessive conservatism of military minds.

From the above examination of this important subject, I think it is apparent that the remedy we seek is comprised in a combination of logical ability and military character—the ability to reach sound conclusions from established facts, and the character to accept, adopt, and fight for these conclusions against any material or spiritual forces.

A navy to be successful must be guided not only by men of ability but by men of an intellectual honesty that is proof against personal ambition or any other influences whatsoever.

Which of us will be quoted in future as examples of dangerous conservatism? Of which of us will it be said that we were of:

The many who follow the beaten track,  
With guideposts on the way;  
They live and have lived for ages back  
With a chart for every day.  
Someone has told them it is safe to go  
On the road he has travelled o'er,  
And all that they ever strive to know  
Are the things that were known before.





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## UNDER WHICH GOVERNMENT DEPARTMENT DO SHORE RADIO STATIONS BELONG?

BY COMDR. S. C. HOOPER, U. S. NAVY

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In reviewing the subject of the utilization of wireless or radio as a medium of communication, with a view to possible modifications in the existing government policy as established by President Roosevelt in 1904, and having in mind the national interests, now and in the future, not only from the viewpoint of economics but also the national defense and our responsibilities from a humanitarian point of view, consideration should always be given to four aspects of the question which obviously are of primary importance, namely:

(a) The highly technical nature of the comparatively new radio art which is virtually in its infancy particularly as regards development, with the consequent necessity—especially in the interests of the national defense—for consistent investigational, research and development work, to insure that the most modern radio facilities, for the exchange of communications, and also defensive and offensive naval tactics, will be available for use, primarily by our Atlantic, Pacific, and Asiatic fleets in time of war, and for the safety of life and property at sea, and secondarily by the military service and for general public and governmental uses.

(b) Interference from atmospherics and interference between stations and the vital necessity of greatly lessening or entirely eliminating such interference. The growing seriousness of the problem of interference with the constantly increasing number and power of radio stations can be appreciated only by radio operators who are charged with the responsibility of getting their traffic through.

(c) The present use and potential possibilities of radio waves, and also sound waves, for other than communication purposes,

i.e., as an aid to navigation for ships and aircraft (radio compass and radio piloting cable), location of enemy ship, shore or aircraft stations in time of war (radio compass), to assist aircraft in night flying and landing (radio beacon under development), radio control of ships, aircraft, torpedoes, in time of war, detection of submerged submarines (sound waves), etc.

(d) *The fact that radio is the only known medium of communication available for use by ships at sea separated beyond visual distances, and between ships at sea and the land.* This consideration is of prime importance from a humanitarian, as well as a naval point of view, and it vitally affects our merchant marine. Obviously the responsibility rests with our government to see to it that the establishment of radio services in the interior, where land line communication facilities are available—either by government or commercial interests—shall not impair the efficiency of the essential ship radio service.

Atmospheric interference caused by electric discharges between clouds during electric storms, and by other reasons which are not thoroughly understood, are a veritable nightmare to the operating personnel, as these disturbances are taking place almost continuously in some part of the world, and they manifest themselves in greater or less degree in the receiving operator's head phones. Interference between stations themselves is no less serious, and in fact, with the constantly increasing number and power of the stations, not only in the United States but throughout the world, the interference between stations is constantly being aggravated, notwithstanding the best efforts of all radio interests throughout the world to produce and employ more selective transmitting and receiving equipment.

The interference between stations can be appreciated when it is considered that, in the present stage of development of the radio art, and until the advent of vacuum tube transmitters in general service, not more than 300 separate wave lengths or "ether routes through space" so to speak, may be put in practical service use, although there are from 4,000 to 5,000 American radio ship and shore stations alone, including naval and merchant ship stations, government and commercial shore stations.

A radio transmitting station which has an effective daylight range of say 1,000 miles during the summer months, may easily

have an effective range of 3,000 to 4,000 miles at night during the winter months. It is impracticable, therefore, to effectually limit the ranges of transmitting stations and stations established in the interior may seriously interfere with essential communications with ships at sea under varying conditions.

It has been suggested that it would be in the national interests to transfer the naval coastal radio stations to the post office department for maintenance and operation by civilian personnel, leaving the naval ship stations to be maintained and operated by naval personnel as at present.

There are nine potent reasons why the naval shore radio stations should not pass into the control of the Post Office Department.

#### ECONOMY

(1) The navy must always have its radio organization—in Washington, in the navy yards and afloat—to provide, install, maintain and repair the radio installations on ships and aircraft and to operate the equipment.

The navy organization in the field, based on the various navy yards, now handles the shore stations with the ship and aircraft stations without any appreciable increase in expense or of personnel, due to the fact that the work at the shore stations can ordinarily be taken care of during times that ships are not in port, material and equipment is stored with general stores at the yards, shop facilities of the yards are available for repairs, etc.

If the coastal stations should be transferred to another department of the government the purchase, transportation and storage of complete apparatus, spare parts, and material would be handled by two separate departments instead of one, and two administrative and field organizations would be maintained with the consequent inevitable increase in government expenditures due to separate storage space rentals, duplicate stock carried on hand, increased personnel, overhead, etc.

In the event of the transfer of the coastal stations to the Post Office Department civilian personnel will be employed, replacing the naval enlisted and officer operating personnel, and additional technical and supervisory personnel will be necessary.

The naval enlisted operator's pay averages approximately \$75 per month and \$30 per month subsistence or approxi-

mately \$1,260 per year. It is understood that the Post Office Department now pay their radio operators \$1,800 to \$2,000 per year. It is not known what they pay their supervisors in the field.

Present living quarters must be maintained at most of the stations regardless of which department operates them, as most of the stations are at isolated localities along the coasts and the personnel must live at the stations.

It is obvious from the foregoing that a change would inevitably result in greatly increased government expenditures.

#### RESEARCH AND DEVELOPMENT

(2) The navy organization must also be maintained to develop radio and sound equipment for naval vessels and aircraft. It should be borne in mind, in this connection, that radio, and also sound, are now extremely important mediums, not only as regards communications in connection with safety of life at sea and for general communications and navigational purposes in time of peace and war, but particularly as regards naval tactics in time of war (radio controlled ships, radio controlled torpedoes, location of submerged submarines, etc.).

It is essential, therefore, that our radio and sound research and development work at least keep abreast of the art and of developments in foreign countries, and this work must be carried on by the navy regardless of what other government departments become interested in radio.

#### DUPLICATION

(3) Should the coastal stations, which must handle a large volume of military traffic, be placed under the Post Office Department, the inevitable tendency would be for the post office civilian personnel to give such preference to commercial traffic that the army and navy would eventually not only find it necessary to handle their own traffic through such special stations as they would retain with their own specially qualified personnel, but new special stations would be permitted to grow up and eventually we would have not only the army and navy special stations which now handle both military and commercial traffic, but also a separate chain of post office or purely commercial stations.

Our attempt to avoid duplication would inevitably result in duplication to an even greater extent.

The revenue derived from commercial traffic handled through coastal stations will not nearly pay for the maintenance and operation of the coastal stations and the primary justification for their existence is to afford safety to life and property at sea, to serve our Atlantic, Pacific and Asiatic fleets and for general military purposes.

The retention of the coastal stations, now used for both commercial and military traffic, under the department primarily interested in the maritime service, is bound to result in the least possible duplication of effort and governmental expenditures.

#### GENERAL EFFICIENCY

(4) The radio communication service is vital to the interest of the mariner as outlined in the foregoing. The Post Office Department will never have the knowledge of these interests that the navy will always be in a position to have.

On account of technical difficulties, mainly through interference, the use of the radio is decidedly limited, and, being limited, must be safeguarded for the service which cannot have land wire facilities.

The uses comprise primarily, communications between ships at sea, for ships communicating with shore, for ships navigational use in thick weather, and for aircraft where absolutely necessary to make landings.

Secondarily, for competition with the cables overseas in order to improve the service and reduce rates. (This does not interfere with the land stations due to the long wave lengths adopted for oversea use, and the natural use of shorter waves for shorter distances on shore.)

If a maritime department has jurisdiction of the radio, the ships at sea, naval and merchant, will be assured of preference, also the military will be looked out for satisfactorily.

If, however, a non-maritime department has control, the inland service will become the strongest, and those which should really be given preference will pass into the background, and the prime use of radio will become its secondary one.

This is perfectly sure to happen as the politics of the interior have little regard for the demands of the ships which are not so strong in their representation.

Officers and enlisted men trained in naval problems at sea, when on duty at shore radio stations can visualize conditions at sea and give superior service to mariners than would ever be possible under a civilian department.

#### SPECIAL STATIONS

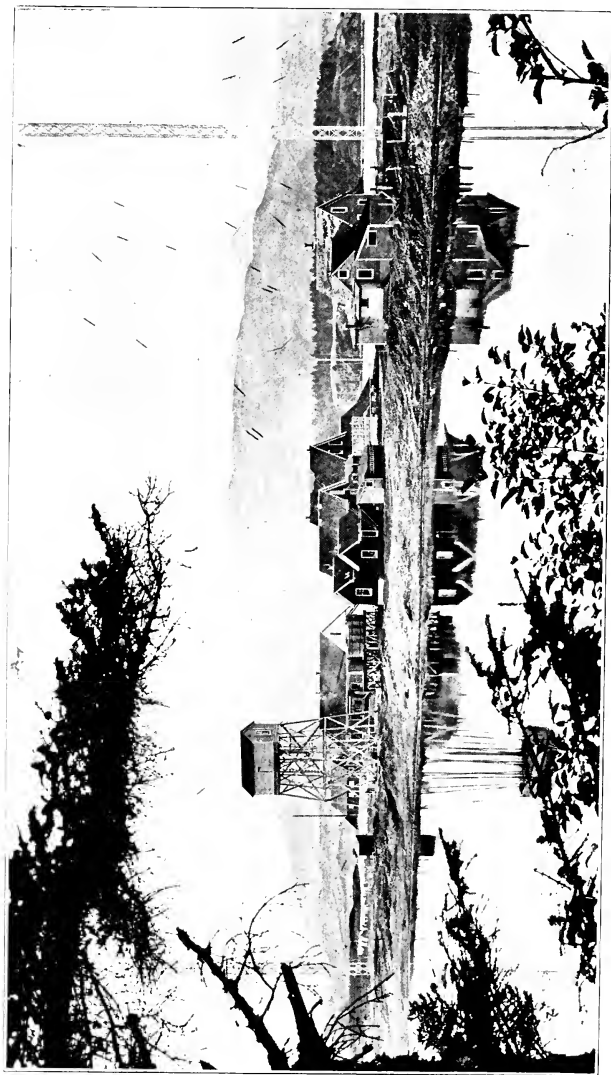
(5) There are special coastal stations which, it is believed, it would be impracticable for the Post Office Department to administer and operate in any event and if this should prove to be the case there could at best be only a partial transfer of the coastal stations and this would likely lead to confusion as well as increased expenditures with inferior service.

Particular mention is made of our outlying stations established for the fleets and usually located within naval stations.

Peking, China (Asiatic Fleet).  
Vladivostok, Siberia (Asiatic Fleet).  
Cavite-Los Banos, Philippines (Asiatic Fleet).  
Olongapo, Philippines (Asiatic Fleet).  
Guam-Merizo, Marianas (Asiatic Fleet).  
Pearl Harbor-Heeia-Wailupe, Hawaii (Pacific Fleet).  
Tutuila, Samoa (Pacific Fleet).  
Darien-Colon-Coco Solo-Balboa, C. Z. (Pacific and Atlantic Fleets).  
Cape Mala, Republic of Panama (Pacific and Atlantic Fleets).  
Puerto Obaldia, Republic of Panama (Pacific and Atlantic Fleets).  
La Palma, Republic of Panama (Pacific and Atlantic Fleets).  
Managua, Nicaragua (Marine Corps) (Pacific Fleet).  
San Juan-Cayey, Porto Rico (Atlantic Fleet).  
Camaguey, Cuba (Marine Corps) (Atlantic Fleet).  
Guantanamo Bay, Cuba (Atlantic Fleet).  
Port au Prince, Haiti (Marine Corps) (Atlantic Fleet).  
Santo Domingo, D. R. (Atlantic Fleet).  
St. Thomas, Virgin Islands (Atlantic Fleet).  
St. Croix, Virgin Islands (Atlantic Fleet).

There are also ten naval radio stations located mostly at isolated points in Alaska in connection with which the U. S. S. *Saturn* makes annual radio expeditions from the navy yard, Puget Sound, to carry supplies, effect new constructural work, make repairs, etc.





VIEW OF ONE OF THE NAVY'S ISOLATED RADIO TRAFFIC STATIONS, SITUATED AT KODIAC, ALASKA



Moreover, more than half of all the naval shore radio stations are located within navy yards and naval stations and with outlying marine corps detachments, under the immediate jurisdiction of the commandants or commanding officers.

It is obvious that the Post Office Department would require a very extensive organization in the field to cover this territory. At the present time the Post Office Department has no particular interests whatever in these outlying territories, whereas the navy has very particular interests and a complete field organization to meet its needs.

The army also has a few low power special stations in our outlying territories for military purposes in connection with the various army posts, but these special stations will always be required by the army for military purposes. Closer co-operation between the army and navy is possible to keep the number of these special stations at a minimum than would be possible with a civilian department such as the Post Office Department, as the army and navy sympathies and interests are similar.

#### OBSERVATION OF COMMERCIAL RADIO ACTIVITIES IN THE INTERESTS OF THE NATIONAL DEFENSE

(6) The radio art is just now in a state of transition and it is very necessary for the government to constantly watch the activities of the commercial interests and their development and relations with foreign interests. Should the Post Office Department take over the control of radio at this time it will require many years for this new department to become familiar with the ins and outs of radio practice and it will not be in a position to cope with the commercial interests until sufficient knowledge is obtained to do so, which will require years, and in the meantime the commercial interests will be at liberty to adjust matters to suit themselves. The navy keeps posted on radio developments in foreign countries through the offices of the naval attachés.

#### RADIO AIDS TO NAVIGATION DEPENDENT ON NAVAL TRANSMITTING STATIONS

(7) Sixty-two radio compass stations have been established on shore along our coasts within the past three years as aids to navigation.

These stations have been located at harbor entrances to guide ships into port during fogs and thick weather, and at strategic points along the coasts as aids to navigation and for military purposes.

The importance of this branch of the radio service is shown by the fact that 35 stations during the fiscal year 1921 furnished 53,344 radio bearings to 21,622 vessels.

Most of these shore compass stations (receiving) are tied into the coastal traffic stations for transmitting service. A few of them are so located that they have their own transmitters. Most of the compass stations, however, use the nearby naval coastal traffic stations transmitters, thus avoiding duplication of transmitting stations, quarters for housing the operators, etc. Experience has shown that operators having sea service are required for the efficient handling of navigational radio stations.

It is obvious that the Post Office Department would not be interested in these compass stations in any event, although the operation of the majority of them is dependent on the nearby coastal traffic stations.

#### LABOR

(8) If the coastal stations are manned by civilian personnel, it may be expected that these men will affiliate themselves with existing radio labor organizations with the consequent possibility of subsequent labor troubles in a service which is vital to the fleets and the merchant marine, not only in time of war but also during peace times.

#### CONTENTMENT OF NAVAL RADIO ENLISTED PERSONNEL

(9) It is generally conceded that a more intelligent class of enlisted men is required in the radio service than in other branches of the navy, and that these men be alert and absolutely reliable.

A large majority of navy radio operators are high school graduates. These men are given daily or periodical instructions in theory, operating procedure, naval radio tactics, etc., when off duty, both on shipboard and at shore stations and are kept informed of the latest developments in radio and sound.

The most deserving men in the fleets are given the privilege of two years duty on shore out of their enlistment of four years, and there are few operators who do not do their utmost to obtain



VIEW OF ONE OF THE NAVY'S EXTREMELY ISOLATED RADIO COMPASS STATIONS, SITUATED AT  
CAPE HINCHINBROOK, ALASKA



this privilege, particularly the married men. Aside from the hardships entailed, especially to men of long years of service, the inevitable result of the withdrawal of this privilege from the naval radio operators would be less intelligent and reliable men in the communication service of the navy with the consequent detriment to this important branch of the service.

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It has been suggested that the Post Office Department has better facilities for distributing traffic to the public than has the Navy Department, that the Post Office Department can *mail* radio messages to destinations, etc.

The commercial telegraph and telephone land lines have always had connections to the naval coastal traffic stations and all traffic is relayed to and from the coastal traffic stations over these lines. The Post Office Department would simply follow this same procedure. The argument that the Post Office Department can *mail* radio traffic is valueless, as this same service is open to the navy for the extremely small percentage of traffic which is subject to delivery by mail. Incoming radio messages are invariably delivered to their destinations through the commercial telegraph and telephone companies' facilities.

There seems to be an impression that the army is duplicating the navy's work by maintaining and operating a costly shore station plant. This is not the case. The navy has a practically world-wide radio service—stations ranging in power from a few watts to the super-high power shore stations of 500 kilowatts power, and practically all of the army radio traffic, other than purely local military traffic, is handled over the navy circuits. The only exception to this is the army's chain of low power stations located in the interior of Alaska with the connecting military cable between Seattle, Washington, and Valdez, Alaska.

The army system, other than the Alaskan system, comprises essential low power stations located at various posts and portable field equipment for use with troops on the march. The army Alaskan stations are all located at army forts but this circuit is used to provide communications between the United States and the interior of Alaska in the absence of other means of communication. The other stations are used for local military purposes.

The navy can have no objections to the establishment and operation of shore radio stations by the Post Office Department in the interior for use in connection with their air mail service, provided these stations do not interfere with essential ship traffic. If these stations interfere with ship traffic then their retention is clearly unjustifiable, as the operation of the air mail service is not absolutely essential, whereas the operation of our navy and merchant marine is absolutely essential and the maintaining of communications with the ships at sea is equally essential.

The navy likewise can have no objections to the broadcasting of news by radio by the Bureau of Markets, or other similar unessential innovations provided this service does not interfere with the ships communication service, but it must be obvious that such additional services will inevitably increase the serious interferences in the already over-crowded radio field. Moreover, the inauguration of these various additional services simply means increased government expenditures and it is extremely doubtful if such services can be even moderately successful in the present stage of development of the radio art.

The navy stands ready to furnish such additional services as it may be desired to experiment with, through its existing stations, to such an extent as will not seriously interfere with the ship to shore service, and it has always advocated the use of its stations for the services of other government departments.

It is understood that the Post Office Department contemplates establishing radio stations in the interior to provide facilities for communication in competition with the existing land lines to some extent. The objections to this proposal from the viewpoint of interference, and in view of the fact that such a service is not essential, are indicated in the foregoing paragraphs.

As a matter of interest, in this connection, a very conservative estimate will be given covering the principal items in connection with the establishment, maintenance and operation of a medium power station with an effective range of approximately 350 miles. No estimate is given covering supervision and overhead.

2-200' Antenna supports .....	\$ 5,000.00
(guyed pipe masts)	
1-2-KW Transmitter (arc) .....	3,000.00

Antenna and ground system .....	500.00	
Receiving apparatus .....	300.00	
Operating building .....	5,000.00	
Land .....	200.00	
Contingencies .....	500.00	\$14,500.00

<i>Maintenance</i> —Light, heat, electric power, preservation		
of property, expendable supplies, etc. ....	\$ 800.00	\$ 800.00
4 Operators at \$1,800.00 per annum .....	\$ 7,200.00	\$ 7,200.00
Total .....		\$22,500.00

A comparison of the amount involved in connection with the number of stations contemplated and the tolls now being paid for the land line telegraph and telephone traffic will, it is believed, clearly indicate that such a proposed radio service would be uneconomical.

The navy has always advocated government ownership of the coastal radio stations with a view to lessening interference between stations as much as possible, both ship and shore, by having the control, administration and operation of all stations under one department of the government. This has not as yet been accomplished, however, due to the opposition of Congress, but it is believed this will eventually come about. Government ownership of radio stations in the interior would not appear to be necessary, provided regulation is exercised such that the uses of these stations are limited to those which will not interfere with the use of radio by ships at sea.

Marked improvements in the radio service are always the result of long and painstaking research, experimental and development work, and this work must be handled by skilled personnel of long experience. The naval radio organization has been consistently built up for the past twenty years and especially qualified officers, enlisted men and civilians have been engaged in the radio work of the navy in the particular interests of our fleets, with the result that today the naval communication service is foremost in many respects among the radio services of the world, and reliable service is available to the government between Washington and the Atlantic, Pacific and Asiatic fleets and their auxiliaries.

Any action which might result in the impairment of this service or retard its future development, either from the view-

point of general communications and the safety of life at sea, or as regards defensive and offensive naval tactics, would be unfortunate.

It is believed that any division in the control, administration, and operation of the coastal stations and the ships stations would inevitably lead to serious impairment of the service and also future developments in the radio art.

The conclusions of the Inter-Departmental Board of 1904, as approved by President Roosevelt, which read, in part, "*that the maintenance of a complete coastwise system of wireless telegraphy by the Navy Department is necessary for the efficient and economical management of the fleets of the United States in time of peace and their efficient maneuvering in time of war,*" are more applicable now than then as regards communications alone. Moreover, they are peculiarly applicable today as regards naval tactics and the broad question of the national defense as briefly outlined in the foregoing.



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THE SOUTH AMERICAN ALSACE-LORRAINE

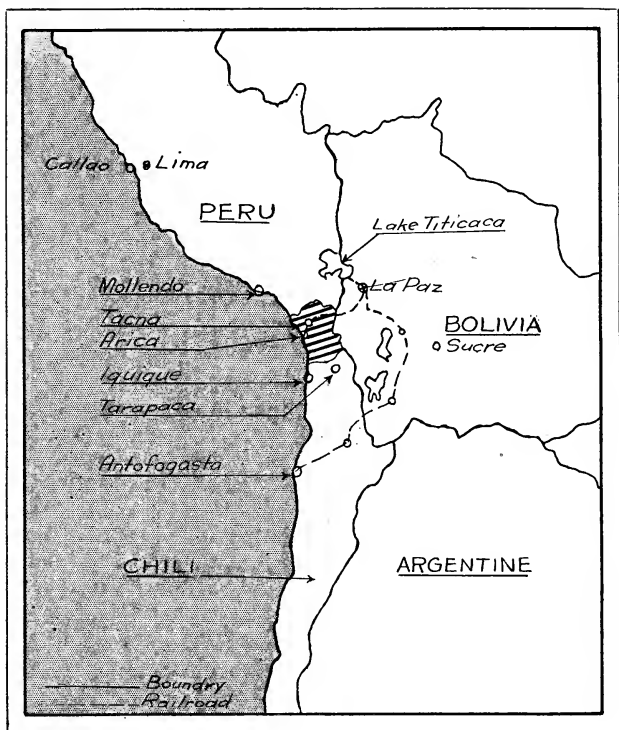
BY LIEUT. J. M. CREIGHTON, U. S. NAVY

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On the face of it, the League of Nations sounds like a very logical affair. You wonder why they don't get something done; why the "Questions" which come to its desks still remain questions. It is only when the details of the obstacles on the road to the solution of an irritation between two nations become apparent, when you consider the input of humiliation and anger and impotent fury, the crushed hopes and fruitless efforts, the burning resentment and sheer physical hurt which boil down in the closing days of a war into the residues of peace, that you appreciate how difficult a matter it is to smooth out some yet-remaining incident of a fight. War injuries do not die out quickly; they are too personal and too severe, and so the situation which remained at the close of the struggle between Chile on one side and Peru and Bolivia on the other during the years between 1879 and 1883, remains today the most unsettling circumstance in South America. It has lately been brought to the table of the League of Nations and the august members of that body have raised their hands in gestures of helplessness at the prospects of a solution.

The Tacna-Arica district is a barren, rainless section in the central west part of South America, shown on the map as the shaded portion.

Until 1883 this part of the coast belonged nominally to Peru. The district below it, containing the port of Antofogasta, was in the hands of Bolivia. The area was of such little importance that the question of the exact definition of the boundaries between the three countries which edged it—Chile, Peru, and Bolivia—had never arisen. There was nothing there to attract any of them, and so there was nothing to call their attention to



the details of the lines of division. The countries were new and the people were busy at home.

There is a certain impression abroad in the world today that people and nations have suddenly come to a detached, judicial frame of mind which allows them to see all things clearly and to make accurate and honest judgments of international affairs. This is more true than it used to be, in subjects which make no particular difference, but when the matter at stake is very valuable, the clear, impartial vision seems to become impaired, and as soon as it became evident that the nitrate fields in South America were

sources of great wealth, heated arguments arose concerning the possession of the country in which the fields lay.

Impartial historians say that the area was actually settled and the nitrate exploitations begun by private Chilean companies, though the district was understood to belong to Peru and Bolivia. It appears that the Chilean firms flourished to such an extent that the exports from their deposits began to impair the business of private Peruvian companies in other nitrate fields to the north, and the Peruvian Government was moved to place a heavy export tax on the outgoing goods of the Chilean firms for the purpose of assisting their own investors. Peru controlled the ports which the Chileans used and was able to do this, but the irritation occasioned by the taxation led to the breaking out of war in 1879. Bolivia joined Peru in the struggle and it was expected that the Allies would promptly dispose of their southern neighbor.

The conflict lasted four years and was of a most desperate and bloody character. The intimate history of the affair reveals that the battles were not characterized by much staff skill or maneuvering, but the courage and tenacity of the troops on both sides was beyond question. The Allies moved their forces to the south and the Chileans advanced to meet them. The war on land favored the latter, and their success was materially assisted by their victories on the sea.

Bolivia had no navy and the Chilean sea forces were slightly superior to those of the Peruvians, especially in the matter of iron-clads. Three sea encounters reduced the Peruvians to the condition in which there were only two small coast-defense gun-boats to protect Callao. With the practical obliteration of the enemy's navy, Chilean transports now moved north along the coast and interposed their troops between Lima and the main Peruvian forces in the south. In the last year of the war they landed an army at Callao and advanced on the capital. The story of the defense of this city is a duplication of the tales of the fury, and desperation, and determination with which the Flemish cities were protected against the Duke of Alva. Old men, women and children were pressed into the ranks of the defenders. The death tolls on both sides were very heavy, but the Chileans finally broke through.

The victors stayed in the capital for a matter of six months while the terms of the treaty of peace were being dictated and signed, and the memory of those days, and the humiliation and pain which the defeats of the war engendered, are still very lively in the countries which were concerned.

As a result of the war Chile took the port of Antofogasta and the whole province back of it from Bolivia, and the Tacna-Arica district from Peru. Both countries thus lost areas of the greatest value, which have since enriched Chile. Bolivia, as the map will indicate, was completely cut off from the sea.

The Treaty of Ancon terminated the conflict between Chile and Peru. One provision of that document was that a plebiscite was to be held in the Tacna-Arica district ten years after the signing of the treaty; that is, in 1893. But 1893 has come and gone and so have a great many years since. The plebiscite has never been held. Each country demanded such conditions and circumstances for the elections that the other has refused to acquiesce and the province remains in the hands of Chile. Bolivia's treaty with the victors was not actually signed until 1904. Until that time, no Bolivian government would agree to the definite transfer of the area concerned, and Chile merely stayed there in possession. In 1904, however, Bolivia signed a treaty, definitely transferring the Antofogasta district to Chile.

The return of the nitrate fields is the kernel of Peruvian foreign policy and it may properly be said to be as prominent an affair for Bolivia. Chilean diplomacy, or circumstances, or time, have alienated Bolivia from the old alliance with Peru and this has led to a great bitterness between the former partners in the war. Peru has steadily maintained that the Treaty of Ancon is to be held as determining the condition of Tacna-Arica; that is, that it is open to plebiscite. She counted on Bolivian support in this attitude but Bolivia has apparently adopted the idea that this territory is firmly in the hands of Chile, that it will not be got away from her, and that the best business she can do is to arrange some sort of an agreement with that country.

The map shows that from La Paz, a railroad runs to Arica through the city of Tacna and that another, much less direct, encircles two large lakes in Bolivia and finally comes out at Antofogasta. Both these ports, of course, are now controlled by Chile,

and past governments of Bolivia have endeavored to arrange a direct agreement with the Chileans for the export of Bolivian merchandise through these two rail-heads.

The matter was brought to a dangerous point when the League of Nations met last autumn in Geneva. The Bolivian delegation requested that the matter of the revision of their treaty of 1904 be placed upon the agenda for discussion. They drew attention to the fact that every country has found it essential to its progress to have unimpeded access to the world's markets, and that the treaty of 1904 left them isolated from the sea. On this economic basis they requested that the League of Nations take up the matter of a revision of the treaty with Chile so as to give them a seaport. Past governments in Bolivia have endeavored to have the Chileans cede them the Tacna-Arica district, and this endeavor to secure land which was originally Peruvian was one of the causes of the severe ill feeling between Bolivia and Peru which is said to exist. The present government in Bolivia, however, abandoned the effort to secure Tacna-Arica from Chile and has shifted its desires to Antofagasta again.

The Bolivian request to the League of Nations immediately led to a dramatic succession of events. The Chilean delegation announced that if the matter were discussed by the League they would promptly withdraw and go home. Following this declaration, the Bolivians issued a statement to the effect that if the matter were *not* taken up *they* would withdraw from the Conference and go home. In this quandary, the League decided to refer the matter to a special commission with the duty of reporting whether or not the League of Nations was in a position to decide the affair. The matter stayed in this shape until the fifteenth of September. On that date it was announced that the Bolivians had withdrawn their demand, and once more this dangerous question seemed carried over into the future.

December, 1921, however, saw the exchange of a perfect flurry of notes between Peru and Chile on the subject of the disputed provinces. Feeling rose to fever heat. Motions were made in each of the countries, favoring ejection of the Nationals of the other. It was reported that Peru had listed all Chileans among the undesirables to whom admission to the country was to be denied, and rumors came of armed clashes on the frontier.

At the height of the tension the Bolivian government interfered to say that it must be considered in any negotiations concerning the Pacific seaboard, but the following day saw a prompt Chilean note delivered in La Paz, calling attention to the fact that the present questions in no way concerned Bolivia, and that all matters between Bolivia and Chile had been settled definitely in 1904.

On Christmas day the Peruvian government dispatched a friendly note to La Paz, offering to co-operate with Bolivia to bring about subsequent negotiations between that country and Chile, provided the Tacna-Arica matter were settled to Peruvian satisfaction.

The dispute was brought into the highroad toward solution on the 20th of January, when Chile and Peru accepted the invitation of the United States to send their representatives to Washington, and the Pan-American building will be hardly cleared of the Limitation of Arms delegates when those from the disturbed sections of the South sit down in the attempt to remove this long-standing irritation.

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## THE VITAL IMPORTANCE OF RADIO COMMUNICATION IN MODERN NAVAL WARFARE

BY LIEUTENANT HARRY F. BRECKEL, U. S. N. R. F. 2

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The successful carrying out of modern naval warfare is, in the main, entirely dependent upon the art of radio communication. A broad statement perhaps, but nevertheless, one that the writer feels is justified.

The many lessons handed down to us by careful study of the past wars, serve to emphasize the fact that the successful execution of any strategical plan involving a combatant force spread over a wide area, is dependent on the maintenance of reliable communication between the different units comprising the force. THEREFORE THE NECESSITY AND IMPORTANCE OF DEVELOPING AND MAINTAINING A LOYAL, EFFICIENT, RADIO COMMUNICATION SERVICE SHOULD NOT BE UNDERESTIMATED.

The successful functioning of a radio communication service is, of course, based on the efficiency and ability of the men at its head, but too much stress cannot be laid on the necessity for having loyal, competent, enlisted personnel conduct the operation of the various radio stations, both ship and shore.

There can be no doubt as to the superiority of American naval radio equipment over that employed by foreign navies and in this regard we need have no concern whatever. The fact that the United States (and particularly the American navy) is farther advanced in this art is largely due to the extensive research work carried out in this country, fostered, to a great extent, by the Navy Department. American inventive ability has also been exercised to the fullest extent by the insistent demand by the navy for radio apparatus of efficient design. The fact that the radio telephone is today a practical device, is largely due to experimental

and research work either carried out, or fostered, by the Navy Department. As early as the year 1915 the navy was conducting practical tests with radio telephone equipment, and the writer recalls clearly hearing the human voice transmitted via radio, between an American man o' war and a naval radio shore station, in that year.

There can be no doubt but what the individual responsibility borne by the naval radio operator is far greater than that shared by the enlisted personnel of other branches of the service, for much depends upon his efficient performance of the duties of his rating. Higher officials of the service, such as those in charge of the various bureaus, admirals of fleets or squadrons, commanding officers of the hundreds of vessels comprising the navy and many other officers in important positions, all are more or less dependent on the loyalty and ability of the naval radio operator to efficiently discharge his duties, for in these days of divided forces the successful working of the entire service depends upon perfect coordination between the units comprising it, which end can only be attained through the medium of a thoroughly efficient and reliable communication service.

Innumerable instances could be cited to show where, during the late war, dispatches of extreme if not vital importance, were entrusted to the enlisted radio operator and which, if they had failed to reach their destination, might have caused disaster or delay. The entire convoy system which proved so effective, the safety of the vessels at sea, the rescue of survivors of sunken vessels, the warning of vessels at sea to avoid certain areas, the general broadcasting of important information concerning mined areas, etc., the transmission of important dispatches between Washington and the military commanders in Europe, all depended on the efficient performance of the naval radio communication service, the successful operation of which hinged entirely on the loyalty and efficiency of the personnel actually carrying out the practical working details at the different stations, both ship and shore. These facts all serve to show that THE RELIABILITY AND EFFICIENCY OF A NAVAL RADIO COMMUNICATION SERVICE CAN BE NO GREATER THAN THAT OF THE INDIVIDUAL OPERATORS ACTUALLY CARRYING OUT TRANSMISSION AND RECEPTION, REGARDLESS



OF HOW EFFICIENT THE VARIOUS OFFICERS COMPRISING ITS HEAD MAY BE. It can easily be seen that the necessity for having LOYAL and WELL-TRAINED personnel in this branch of the naval service is of paramount importance.

Above all, it should be realized that inefficiency or disloyalty in a naval radio communication service is a condition which should not be allowed to exist and which, if it did exist, would, under certain conditions, jeopardize an entire fleet. Therefore more than ordinary care should be exercised in selecting its personnel. It should be borne in mind that an inefficient or disloyal radio operator is in position to work untold harm, and in the case of the disloyal man it might be stated that there are ways in which he could accomplish his end and still avoid suspicion or detection. By way of example let us assume that a state of war exists. An admiral of a fleet has received a supposedly authentic report from some reliable source to the effect that an enemy force of a certain strength has proceeded to carry out an attack on a certain city on the coast. He has reached a decision that it will be necessary to intercept the enemy force and engage it with a view to destroying same and he, therefore, has dispatched a force of similar character but of superior strength to do so. His force has proceeded to carry out his orders and is now several hundred miles at sea. Suddenly he receives another report to the effect that the enemy force is far stronger than the first report stated. The situation is now such that it is too late to increase the strength of his force to match that of the enemy's and that in all probability his force would be annihilated if allowed to engage in battle. There is, however, still available time in which he can recall his force. What does he do? The only way that he can get word to his force in time is by means of the radio, therefore he issues orders to his communication officer to transmit a dispatch telling the commanding officer of the force in question to proceed to such and such a rendezvous where he will receive reinforcements, after which he can proceed to engage the enemy, if this proceeding be possible, with some degree of assurance that the operation will be successful. Now after coding the dispatch for transmission the communication officer *turns same over to the radio operator for transmission.* It is more than likely that the radio operator is

aware that a certain force has been dispatched, for in the majority of cases he will have been notified to keep a sharp lookout for radio signals from it. Also it may be possible that the enemy force has been using his radio and perhaps, due to increasing signal strength, etc., the radio operator is sure that it is headed toward, or getting closer to, his station. Summing up the general situation he feels sure that an enemy force is moving to attack somewhere, but where of course he cannot say. With the aid of the radio compass, however, it is possible that he may have determined that the enemy was proceeding in a certain direction and that in all probability the force which left some hours previous was dispatched for the purpose of intercepting him. If this operator should happen to be disloyal and should garble the message in transmission by failing to properly space his code characters, or leave out say the first code group WHICH IN PRACTICALLY ALL CODES IS THE KEY TO THE CIPHER USED, or fail to use sufficient power to "raise" the operator on watch at the station being called or in some other way cause the dispatch to fail to reach its destination entirely, the force which it was intended to warn might unwittingly engage an enemy of far superior strength and go down in defeat. It might be argued that the force would have out a scouting line to further insure protection. Granted, but as a rule we are also dependent on the radio for the receipt of information from our scouting line and a similar condition of disloyalty or inefficiency might exist here also. It might also happen that an enemy submarine would be successful in disposing of the only scout in a position to sight the enemy, long before visible contact had been made and many other conditions could arise, whereby it would be impossible for the force to evade an engagement. Now let us assume that the operator transmitting was a loyal, efficient man and that the message was sent in proper form. It may be that the receiving operator is not loyal or is inefficient, in which case the same situation might arise. In my mind too much importance cannot be attached to having tried and true operators in the naval communication service, for much depends upon their reliable performance of duty. There can be no doubt but that the successful accomplishment of our ends during the late war was largely due to the use we made of the art of radio and

a little foresight cannot fail to convey the fact that we will be even more dependent on radio in any future conflict. With the addition of air craft to our fleets for spotting, scouting, offensive or defensive work; with seagoing submarines attached to the fleet equipped so that radio communication with them is possible even though they are submerged; with possibilities of employing radio controlled torpedoes or battleships far from being a vague supposition; with practical navigation of aircraft and vessels by radio not far off, it cannot but be apparent that the art of radio is becoming more and more every day a vital factor in carrying out naval warfare.

In short, so much will be required of the naval communication service in any future war that a great deal of thought should be given toward the careful training of the communication officers and the enlisted operators in direct supervision of the operation details at the different stations. The officers at the head of the naval communication service will no doubt, as they are now, be officers of the line who have had broad experience in all matters naval and who will fully realize the importance to the service of an efficient communication system. Therefore the main problem resolves itself into one of having communication officers and enlisted personnel entirely capable of carrying out the details connected with the organization. During the period of time that the writer served with the Atlantic fleet as a radio operator it was customary to detail officers who had but recently graduated from the Academy, as communication officers on board the different vessels. In some cases these officers had a fair knowledge of matters radio but in the majority of cases they knew little or nothing about it for the reason that they did not study the art sufficiently to enable them to efficiently handle the practical operation of a station. In so far as the handling of the different codes and ciphers were concerned their efficiency was excellent, but when it came to the examination of personnel for advancement in rating, or the actual standing of a watch, or the manipulation of the instruments, or further, to the actual repairing of apparatus which was out of order, these were details which, due to lack of practical experience, they were unable, in most cases, to carry out and dependence had to be placed on the ability of the chief petty officers who, with their broad practical experience

were able to do so. This system worked well even under this apparent handicap, and in many instances within a year's time communication officers who had taken charge of a station with no previous practical experience had become proficient operators and were able to take over the practical operation of the radio equipment. However, in many cases the officer would have many additional duties to perform in which he, due to natural inclination, would take greater interest, with a result that his proficiency as regards matters radio was not as great as it would have been if he had been enabled to follow them entirely. Further, it is believed that at the time not enough importance was attached to matters radio on board ship to provide an incentive for commissioned officers to promote their efficiency in this branch. In the main it might be stated that the subject of radio simply aroused curiosity rather than genuine serious interest as in the case of matters pertaining to ordnance or other subjects dear to the heart of all naval men. The time has arrived, however, when the question of "Radio Efficiency" should be studied with the same tense interest as the subject of "Battle Efficiency," for unquestionably the "Battle Efficiency" of a modern fleet is vitally dependent on the efficiency and reliability of its radio communication service. Knowing this, we should act accordingly. We should have radio communication officers attached to the different units comprising the fleet and also in charge of the numerous important high-powered naval shore stations who are not only interested in the art of radio communication, but who have taken up the study of same and who are conversant with the theoretical principles pertaining to it. These officers should be given an incentive to remain in this branch of the service as long as possible and means for promotion should be provided which would permit of their advancement in rank on a basis equal to that of their classmates serving in the various branches of the line. They should also take up the study of the divers communication methods employed by ALL foreign navies and more especially those of potential enemies; they should be thoroughly conversant with the character of the codes used by the radio operators transmitting so that the radio personnel under them can be thoroughly instructed in the reception of same in order that all enemy communications, in the event of war, could be correctly intercepted for the information

of the commanding officers, or for the Naval Intelligence Bureau. For example, during the early period of the late war a large number of our naval radio operators were not familiar with the so-called "prime" letters used so extensively by the operators comprising the personnel of the Allied and enemy radio forces and for the time being they were unable to intelligently copy all communications heard. Of course it did not take them long to master these new code characters but it would have been much better if they had known them in advance. Further, the communication officer should be in a position to instruct his force intelligently as regards the different systems of communication employed by foreign navies and as far as possible we should have several communication officers who are not only familiar with the various codes employed by foreign operators, but who are also familiar with the various languages. The study of foreign languages by the radio personnel should also be encouraged. Especial attention should be given the various methods of communication used by any potential enemy, with a view to working out details in regard to either maintaining deliberate interference during battle and "jamming" his operators, or determining the best method for getting our communications through without serious interruption. By careful observation it can easily be determined just how many different wave lengths the enemy has available and steps can be taken to interfere on ALL of them with a view to preventing him from getting his communications through. Further, as a rule a flagship does the most transmitting and a careful, observing operator can soon determine simply by the amount of radio traffic transmitted that the particular station in question is an important one and that steps should be taken to pay particular attention to copying all communications transmitted by it, or, if deemed necessary, that means be taken to create interference with his transmissions if possible. An observing operator can also determine by the amount of radio activity going on in an enemy fleet that some unusual activity is taking place or pending. Further, he can easily identify certain vessels after having heard them transmitting radio signals a number of times, in certain cases. Sometimes a station will have a "spark" of a peculiar tone frequency, or there may be a certain operator attached to it who has a certain characteristic way of handling his traffic, and by remembering these

details an efficient radio operator can readily identify this vessel in the future when it is heard transmitting, regardless of whether a call sign is used or not. Perhaps one of the most easily "identified" vessels attached to the American navy was the U. S. S. *Birmingham*, which vessel had a very peculiar sounding "spark" which differed greatly from that of the average vessel. During a war game in 1916 the *Birmingham* was readily "singled out" and identified in spite of the fact that bogus calls were used to prevent it. Also I might add that the writer, during the late war, copied signals from the *Birmingham*, which vessel at the time was serving in waters adjacent to the Mediterranean Sea, and was able to identify her instantly in spite of the fact that he did not previously know she was in European waters. This possibility of identifying vessels can easily be eliminated through the use of arc or tube transmitting systems which are far more efficient and have practically the same "tone frequency," thus making it practically impossible to identify vessels as mentioned above. Radio officers should be qualified to instruct their personnel in regard to the numerous conditions which might arise during the practical operation of a radio station on board ship during wartime. Another essential feature that he should pay particular attention to is the necessity for having competent operators attached to his force who are capable of copying code signals at high speed. It is often possible to prevent an enemy from copying your communications if high speed is employed by the operators in transmitting the code characters. For example, during the late war the enemy was noted for the operating efficiency of the radio personnel; invariably his communications went through at top speed and without waste of time and I recall several instances where our operators were unable to copy his messages because of their inability to copy at high speed. These operators were of course in most cases men who lacked experience, but nevertheless it will be seen that the ability of operators to copy any other operator regardless of his speed is essential, to say the least. Also it might not be unwise to change the dot and dash code characters used by the operators at times for this would be disconcerting to enemy operators trying to intercept our signals, to say the least, for in practically all cases he would be familiar with only the standard code characters generally used and would be utterly un-

prepared for any change with a result that our communications would get through without having been intercepted. There are many details such as these which could be studied and worked out by a communication officer fully interested in the work and proper instruction in regard to same be conveyed to the personnel under his command, with a resultant increase in the state of efficiency of the force. Further, a system of drills could be devised simulating actual battle conditions for the purpose of instructing the personnel as regards the effecting of quick emergency repairs, the clearing away of radio antennae which have been shot away and the rapid erecting of emergency auxiliary antennae to take their place. In short, there are so many details to be taken into consideration by a communication officer besides the maze of instructions relating to fleet traffic, the changing of codes and ciphers and other routine duties, that to give proper attention to same will, without doubt, occupy his entire time. Therefore it seems only proper that an officer having this duty should not be encumbered with additional duties. Of course it may be stated that radio gunners are available to take care of the majority of the mass of detail. Granted, but we should have competent commissioned officers in charge of the Radio Department who are also fully familiar with all its workings as in the case of other departments. With officers in charge of the practical operations as well as the various executive duties it is believed that a general increase in all-round efficiency will undoubtedly result. Due to his superior education various advantages and disadvantages can be more carefully weighed and proper steps taken and he will no doubt often take into careful consideration smaller details of importance which in many cases are overlooked by men charged only with the practical operation of a station. Also, officers who are familiar with the general principles of radio and who have observed the station's operation at first-hand, may be able to devise or invent valuable additions to its equipment, which may further improve its efficiency in battle.

Another angle of great importance which should receive careful attention, is the training of adequate reserve personnel, for in time of war a large number would be required for immediate service. The navy is fortunate in this respect in having available splendid material for this purpose. There are hundreds of thou-

sands of amateur radio operators scattered throughout the nation who with a brief period of training would eventually develop into efficient operators. As a rule the average amateur is more or less familiar with the constructional details of practical radio equipment and the majority of them are proficient in handling the code in a more or less efficient manner, but all of them have a general foundation as regards matters radio which could readily be built up. To provide for the enrolling of the more efficient amateurs in the reserve force, it is believed that the appointment on the staff of the various state reserve force commanders, of radio communication officers to take care of the details of this work, is a desirable feature. In some cases former communication officers are actively engaged in radio research work, or the manufacture of radio equipment, or have taken up amateur radio as a hobby, in which case they are more or less in direct touch with the amateurs in their state and know who are the most desirable for naval purposes. Such officers who are still affiliated with the reserve force, would, no doubt, take up the work of training an adequate reserve radio personnel with a great deal of interest, if not absolute enthusiasm. Many interesting details, such as a chain of naval reserve force radio stations, operated by reserve personnel, for handling the communications of the reserve force commanders, code classes, theory classes, radio drills, etc., etc., could be worked out and put into practice and judging from the writer's personal experience in handling the problems relating to amateur radio during the past two years, it would become necessary to stop enrolling additional recruits, for the American radio amateur is unquestionably a most enthusiastic individual and one can "listen in" almost any hour of the day and night and hear any number of amateur stations "hamming." The average amateur will, with proper training, undoubtedly develop into an ideal naval radio operator, and steps should be taken to sift out the more desirable material for enrollment in the naval reserve force, after which proper intensive training could be provided so that in the event of a national emergency an efficient, reliable radio reserve could be called to the colors, who would be available for instant service.

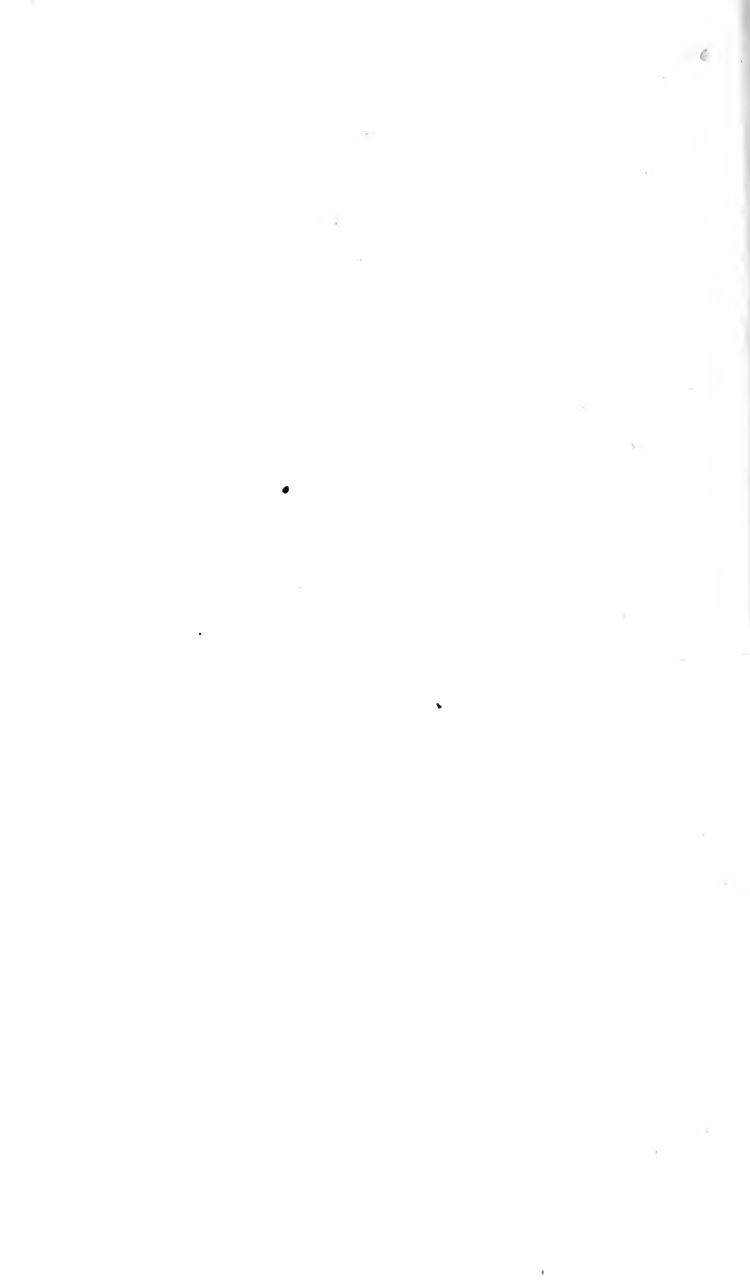
The writer has read with a great deal of interest the timely article written by Lieutenant (jg) H. D. Kent, U. S. Navy, in



the July, 1921, issue of the UNITED STATES NAVAL INSTITUTE PROCEEDINGS and can but agree with him when he states the necessity for having a Communication College for the Training of Radio Communication Officers in the art of radio communications and radio strategy, for much will depend on our having an efficient, organized radio communication service in any future conflict, capable of "going the enemy one better."

In conclusion, might I even go so far as to state that under certain battle conditions, the fleet with the most highly developed communication service will in most cases obtain a decision over the one possessing an inferior radio service?

(Nothing in the article I have written should be construed to cast reflection in any manner whatsoever on the radio communication service, its personnel or the officers attached thereto, for this article was solely written with a view to setting forth the important part that radio will play in any future conflict between the United States navy and a foreign power, and also to set forth certain facts which the writer observed during his service as a radio communication officer during the period of his service with the regular navy.)



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## RELATIVITY

BY LIEUTENANT H. K. LYLE, U. S. N.

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In the past year considerable publicity has been given to the discoveries of Dr. Albert Einstein. His work has been of great importance in the scientific world but it is impossible to have an accurate understanding of his theories without a fair degree of mental application. This article is an attempt to set forth Dr. Einstein's work in non-technical language omitting the mathematical side as far as possible.

The Theory of Relativity is advanced as an underlying law of nature which covers all phenomena whether astronomical, optical, dynamic or electro-magnetic. In other words, all of these phenomena possess some similar qualities and are related closely to each other.

Heretofore time has been considered as an abstract quantity but a development of this theory of relativity will show that it is intimately connected with natural phenomena so that it can no longer be considered as a thing apart but more in the nature of a fourth dimension or factor in locating any event.

At present our basis of classical mechanics lies in the laws of Newton and the geometry of Euclid. Both have proved eminently satisfactory for practical engineering and it seems that they must be so firmly established that their position is unassailable. However, it has been definitely known for many years that these laws do not account for every phenomenon which has been observed. Sir Isaac Newton himself was aware of some of the deficiencies and tried without success to surmount them.

The Theory of Relativity has come to the aid of modern physicists and explained some of these events, such as the advance of the perihelion of Mercury. As a result, it has more or less stated the limitations of Newton's laws and geometry as we have used it.

The reasoning of Dr. Einstein is directed at first principles, and definitions will be necessary at this point so that we may have a complete understanding of later arguments.

The first point in any problem is the necessity of locating any event in space. We do so by means of a "system of coordinates" which may be referred to as a "sphere of motion" or "system."

The "Cartesian system of coordinates" consists of the length of three perpendiculars from the point in question to the three mutually perpendicular planes which compose the frame of reference. The word "length" in this case means that a measuring rod, "L," has been laid along these perpendiculars a certain number of times and this number expresses length in terms of the unit "L." It assumes that the rod "L" does not change during the complete operation.

A system which is sufficiently far removed from all outside influence so that "a body in motion continues that motion in a straight line" is called a "Galileian system."

A "Gaussian system" is one in which an event is located arbitrarily. This system will be fully explained later.

Let us now consider two Galileian systems  $K$  and  $K'$  where  $K'$  has uniform motion in a straight line without rotation with respect to  $K$ . The Special or Restricted Theory of Relativity is expressed thus: "Natural phenomena run their course with respect to  $K'$  and according to the same general laws as with respect to  $K$ ."<sup>1</sup>

Take as an example a train moving along a straight track at a constant speed. Natural events may be observed from both systems, that is, from the train and from the embankment alongside the tracks. Suppose the train is running in a vacuum and a stone is dropped from the window. The observer on the train sees it fall in a straight line while the other sees a parabolic curve. The stone only described one path but both observers are correct. Since they were in different frames of motion, this event appeared differently to each.

Notwithstanding this different appearance all equations having to do with the passage of the stone along its trajectory have the same form and the coordinates for one system can be obtained

<sup>1</sup> *Relativity, the Special and General Theory.*—By Dr. Albert Einstein, p. 15.

by applying certain equations to the corresponding coordinate of the other system. These equations are known as the Lorentz Transformation.

These transformations are the result of investigations to solve the apparent incompatibility of the constancy of the velocity of light in vacuo and the principle of relativity. The solution resulted in a new conception of time.

It was found that time could no longer be considered as an abstract quantity but that it has a very definite relation to natural phenomena and is directly affected by the state of motion of the clock. Briefly, the result is this. Let us consider two clocks of similar construction which have exactly the same rate. We place one of these clocks on the moving train and the other on the embankment. Their rates will now vary slightly. The clock in motion will be slower and the greater the speed of the train the greater the difference.

This discovery permits the retention of both the law of propagation of light and the principle of relativity.

Investigation along these lines also brought out new ideas of measurements. A measuring rod "L" may be used to determine the length of our train by applying to the rails between the points where the front and rear may be observed at any given instant. The same rod may also be applied to the train itself. According to the principle of relativity we shall not obtain the same answer because the measuring rod undergoes a slight contraction relative to the embankment as a result of the motion of the train.

These statements are evolved after extensive mathematical work which is outside the scope of this article. Therefore, I must ask the reader to accept them without thorough explanation.

The preceding conclusions bring us to believe that Shakespeare was right when he wrote, "All that glitters is not gold." Phenomena have different appearances to observers placed in different frames of motion.

This statement will be readily understood by consideration of our moving train once more. Suppose two events occur simultaneously at two widely separated points along the track, A and B. Since our conception of time has been revised, we must define the word "simultaneous" thus:

Track	.....A.....	M.....	B.....	
				Train

An observer situated at M, a point equidistant from A and B, is provided with mirrors so that he may observe both. Light with its constant velocity will take the same interval of time to traverse AM or BM. Therefore if the events which occurred at A and B are observed at M at the same instant, they will be "simultaneous."

But if another observer with similar mirrors is moving on the train in the direction AB the ray of light from A must overtake him while that from B is approaching him and obviously they will not reach him at the same instant. In short, the so-called "simultaneous" events do not appear so to the moving observer because of his motion with respect to the embankment.

All of these examples are formulated under the Special or Restricted Theory of Relativity where the relative motion of one system with respect to the other is limited to a uniform motion in a straight line. It is clear that all motion uniform or accelerated in a straight line or rotation has some effect which cannot be ignored. There are other influences also, such as gravitation, that may not be disregarded. It has been shown that one kind of motion causes a variation in the behavior of measuring rods and clocks. These variations render the Cartesian system of coordinates inadequate for the statement of the General Theory of Relativity.

To overcome this difficulty, Gauss invented a system of coordinates which bears his name. Suppose we have under consideration a surface or two dimensional continuum. This surface is covered with an infinitely large number of arbitrary curves so arranged that two and only two of these curves pass through every point of the continuum. A number is assigned to each curve so that any point may be located by giving the numbers of the curves which intersect there. For continua of more than two dimensions additional curves are used so that each point is the intersection of as many curves as the continuum has dimensions. This Gaussian system is a generalization of the Cartesian system and by virtue of its arbitrary construction effectually overcomes the disadvantages of the Cartesian coordinates.

The General Theory of Relativity may be stated as follows: "All Gaussian coordinate systems are equivalent for the formulation of general laws of nature."<sup>2</sup>

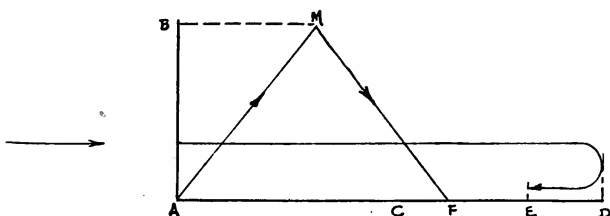
<sup>2</sup> *Relativity, the Special and General Theory*.—By Dr. Albert Einstein, p. 115.

The most interesting part of any study of the theory of relativity lies in the experimental work which supports its results. Because of the infinitesimal intervals of time and distance to be measured, there are only a few of these experiments possible.

According to the principle, it is impossible to detect any motion of the earth with respect to the ether which we regard as space. In other words, by no experiment, optical or dynamic, are we able to determine absolute motion.

Professors Michelson and Morley conducted a series of experiments which, disregarding relativity, should have shown the existence of this ether drift.

Their method may be seen from a consideration of the following example:



A is a source of light, B and C are mirrors 186,000 miles distant from A, AB is perpendicular to AC. All three points are rigidly connected and the entire system is moving along AC at half the velocity of light, 93,000 miles per second.

If the system were at rest, a ray of light released at A would require two seconds to reach B or C and return to A. But because of the indicated motion light will require two seconds to overtake C at D and  $\frac{2}{3}$  of a second more to return meeting A at some point E making a total of 2.667 seconds.

The ray traveling to B would reach it at some point M requiring  $\frac{2}{\sqrt{3}}$  seconds and returning in the same time would meet A at some point F, making a total of  $\frac{4}{\sqrt{3}}$  or 2.309 seconds. The difference is quite perceptible.

If now we fix our mirrors on the surface of the earth and one path of light be along the direction of the ether drift, we should be able to detect this drift or motion of the ether with respect to the earth by this different return of the rays.

In the actual experiments the mirrors were only a few feet apart and the time interval to be measured only about one quadrillionth of a second but the apparatus employed could detect this interval. But in every case the two rays returned in exactly the same length of time.

The Theory of Relativity explains the failure very easily. Our time intervals are all relative to that imaginary fixed point in space. The mirror system is shortened along AC with respect to a system of coordinates attached to this point in such a manner that the experiment results in failure. Since Relativity and this result agree, we have one argument in support of the theory.

Three positive confirmations are required for the retention of the Principle. They are:

1. Light is affected by gravity.
2. Advance of the perihelion of Mercury.
3. Slight difference in the lines of the solar spectrum as compared to the laboratory spectrum.

According to the Theory of Relativity light rays have a curvilinear path in gravitational fields.

Take for example a reference body undergoing an acceleration with respect to another. Any body moving in a straight line with respect to one will have a curvilinear path with respect to the other. Rays of light will come under this principle.

Now consider an observer in a large chest free from all gravitational influences. Newton's law of motion holds absolutely within the chest. But if a constant force be directed up from an outside source, the chest will undergo a constant acceleration.

At first the observer had nothing to hold him to the floor of his chest and the slightest pressure on the floor caused him to float upward. But as the chest is accelerated he notices a downward pressure which must be accounted for. If he knows of gravitational fields and is unaware of his acceleration, he will come to the conclusion that he is in a gravitational field and may carry out various experiments to substantiate his theory. These experiments will run their course in exactly the same manner as if his theory were correct.

Therefore we conclude that an acceleration affects natural phenomena in the same way as gravitation. It is impossible for this observer to tell the difference, because he cannot detect the



absolute motion of his chest. Suppose yourself in a train with another standing on the next track. Very often you become aware of a relative motion but until you feel a jar or look at the ground, you cannot tell which train is moving.

To go back, if one reference body be undergoing an acceleration with respect to another, light rays which travel in a straight line with respect to first will travel in a curved line with respect to the second. If an observer on the reference body undergoing the acceleration is unable to distinguish between this acceleration and a possible gravitational field, we may conclude that the light rays will be affected by gravitational force just as they are by the acceleration. In short, light travels in a curvilinear path when under the influence of gravity.

This postulate of Relativity was proved conclusively by observation of light rays passing through the gravitational field of the sun.

During the total eclipse of the sun on May 29, 1919, British astronomers took photographs showing the stars which were visible nearly in line with the sun. Several months later more photographs were taken of the same stars only at this time the sun was in another part of the heavens.

As compared to the second observation the stars on the first plate appeared to be displaced outward from the center of the sun. The calculated curvature of these light rays was only 1.7 seconds of arc and the photographic results coincided very closely with the displacement which would be caused by this figure. The discrepancies in each case were in such a direction as to show more rather than less curvature so that this point is confirmed beyond any doubt.

It has been known for some years that the perihelion of Mercury has been advancing along its orbit at a rate of 43 seconds of arc per century. According to Newton's laws the perihelion of all the planets should remain stationary with respect to the sun.

Calculation under the Theory of Relativity shows that the perihelion of each planet should revolve slowly about the sun and that in the case of Mercury this rotation should be exactly 43 seconds of arc per century.

In the case of the other planets, this advance is too small to be observed with our present means. This difficulty is increased by the fact that Venus, which is next to Mercury in proximity to the

sun, travels in an orbit which is nearly a perfect circle and its perihelion is correspondingly difficult to locate exactly.

The last point to be confirmed arises from the statement that the frequency of light waves is dependent on the intensity of the gravitational field in which the source is situated.

As the earth is smaller than the sun, the difference should be detected by a comparison of a spectrum from each source. It manifests itself by a deflection of the lines toward the red in the solar spectrum compared to a laboratory spectrum.

The difference in frequency only amounts to about two millionths of a wave length so it is difficult to measure. However, scientists in various parts of the globe have detected the difference so that it is almost beyond any question of doubt. There are some investigators who have failed to get this result and so this point is still the subject of some dispute.

Taken all in all the results of these experiments are sufficient to establish the Theory of Relativity as a law of nature. The laws of Newton become close approximations when the Principle of Relativity is accepted. His work, like that of Euclid, requires certain conditions which are realized. The reasoning of Euclid which seems so logical and unassailable to the school-boy is correct but as we cannot in practice be sure that a distance measured in one direction is equal to one measured at right angles to it, we are not justified in accepting the various hypotheses of geometry as practical facts from a truly scientific standard.

Geometry then is not an exact science of natural phenomena but as a close approximation it will suffice as a base for mathematics.

The Principle of Relativity gives us a more correct understanding of the laws governing the phenomena of the universe but as it differs only very minutely from our present understanding, our everyday mathematics will not be affected.

As far as popular opinion goes, the greatest result will be the acknowledgement that Dr. Einstein is the greatest physicist of the age, if not of all time.

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## PRINCIPLES OF COMMAND

BY REAR ADMIRAL LLOYD H. CHANDLER, U. S. NAVY

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### KNOWLEDGE OF THE PRINCIPLES OF HIGHER COMMAND HIGHER COMMAND

By the expression *higher command* the present writer understands is meant the larger activities pertaining to the duties of a commander-in-chief or of other officers still higher in military authority, but it is difficult to make an exact differentiation and state definitely just what activities pertain to *higher* and what to ordinary command. Beyond a doubt, however, the creation of broad general plans: strategic, tactical, administrative, of organization, etc., are attributes of higher command. Perhaps an understandable rough dividing line may be indicated by saying that such general plans are comprised within the functions of the higher command as are created and as a whole retained by the officer creating them and by his superiors in office; portions and details only being transmitted to subordinates from time to time, and perhaps in different form, as it becomes necessary for such subordinates to carry them out. Again, it may be said that the functions of higher command are those which have no counterpart within the sphere of the subordinate; such, for instance, as the organization of a fleet composed of forces of different types, or as the making of strategic plans for a campaign or tactical plans for a battle. The definition is far from perfect, however, for while the commander of a battleship force, for example, has no problem of organizing a fleet composed of different types, still he has, or should have, a large voice in organizing a force of ships of the same type into administrative and tactical units, etc.; a task not essentially dissimilar in principle from that of his senior. Similarly, such higher subordinate commander may be called

upon at any time to command a detached force on independent detached duty, and then the organization of the task forces and the preparing of plans fall upon him.

So, while the above discussion is illustrative, it is perhaps wisest to avoid attempting any definition and to say in general terms that the phrase *higher command* includes the greater and more important activities of officers of high rank. Accepting this general definition, it may be said that the principles underlying the conduct of the higher command are those which underlie every sort of command, from the highest to the lowest, but that it is the higher command that calls for the fullest knowledge of *all* the principles of command, and for the most exact, careful, and effective application of them all.

#### PLAN MAKING

While plan making is of course an essential preliminary to every well-conceived and well-executed activity, the term is nevertheless generally employed in our vernacular as implying the preparation of plans of campaign for actual war or for maneuvers in preparation for war. For the former purpose a *Planning Section* has been established in the Division of Operations, Navy Department, and in this section plans are formulated for possible campaigns and thereafter kept up to date according to latest information received and to follow possible changes in policy by ourselves and by possible enemies and friends. Supposedly in close conjunction with this section would work the officers in higher command afloat; those who would be charged with the execution of such plans should the occasion arise. To prepare officers for such planning duty the War College is maintained, where officers are taught, not the best methods alone, but, what should be the same, the accepted standard methods for doing this work. Considering the making of plans as a mission, the War College trains the necessary personnel for carrying on this work, and the Planning Section actually carries it on by means of the personnel trained by the War College.

Not only must the high command officers necessarily take the part indicated in the work of the Planning Section, but they must, each in his own sphere, carry out the lesser plan making necessary for employing the fleet or its units for the purpose of carrying

out the greater plan. And so it runs down through many leading subordinates—plans within plans! The great general plan involves separate, although coordinated activities for the several higher subordinates; the particular plan of each such subordinate involves another lesser plan by each of his immediate leading subordinates, etc., and this continues until it becomes unnecessary for the final subordinate reached to draw up a written plan. Thus a plan of campaign issues from the Department; the commander-in-chief draws up and issues his plans to his force commanders, who in turn transmit these orders, or else prepare their own plans and instructions, and issue them to their commanding officers. In most cases the mission of a ship in a division is merely to carry out orders received as they are received, and at that point the preparation and issuance of special written orders ceases as a rule to be necessary; such matters are properly covered by standing orders and regulations of the fleet and ships. It is therefore apparent that all these plans should be drawn up in the same general manner and in accordance with the same general line of thought, in order that, taken together, they may form an effective and consistent whole. Hence we see that in planning, as well as in execution, indoctrination, mutual understanding, and co-operation are of vital importance. And it will no doubt be readily granted that the detailed methods of doing this work, the mechanics of it, so to speak, must necessarily be the same in all cases if we wish to avoid friction and misunderstanding.

Passing from the higher plan making of actual war, we come to that of simulated war; that is, of maneuvers. The process is the same in this case, and it is only necessary to point out in regard to it that maneuvers are not only for the purpose of exercising the fleet, etc., but are essentially a means for exercising the higher officers in coordinated effort in the plan making branch of their profession.

Further down still, we have the plan making necessary for carrying on the daily peace time activities of the fleet; in its highest form represented by the Navy and Fleet Regulations, Standing Orders, etc., all of which must at times be supplemented by special orders covering special contingencies. The more nearly the methods adopted in this work follow those taught for the

higher plan making, within reasonable and common sense limits, the more highly effective will be the work of the fleet and of the several units composing it.

#### STAFF WORK

The staff is the personnel which carries on the personal work of the officer in high command. Reference has been made to the *mechanics* of plan making, and as in that case, so also in every other activity, there must be certain *mechanics* of operation whereby the will of the commander is made known to and enforced upon his command. It is the duty of the officers of the staff to operate such mechanics effectively: they are concerned in all work done by the officer in high command, from the most important, the making of war plans, to the least important. His mind creates; theirs provide the detailed means for carrying out his conceptions, and they personally perform the incidental labor. It therefore goes without saying that the more highly educated are the staff officers in this particular class of work, other things being equal, the more effective is the work of the commander—a strong reason for the establishment of a school for prospective staff officers.

Not only are the staff officers concerned in the larger affairs of the fleet, but in one way or another, to a greater or lesser degree, their influence pervades and their actions affect almost every fleet activity, even the least. It is therefore necessary that such officers should possess in the highest possible degree all the qualities necessary to enable them to play their part in these lesser things, as well as in the greater, without creating friction or discord, and to the betterment of the fleet and the upbuilding of morale and efficiency; in a word, a good staff officer is one who in a high degree himself possesses all the qualities necessary for the efficient exercise of command.

#### KNOWLEDGE OF HOW TO ACQUIRE KNOWLEDGE

A most important requisite in the way of knowledge is the possession of the knowledge of how to acquire knowledge. At the Naval Academy (and the same is true of all schools and colleges in civil life, although in a lesser degree at the more advanced technical schools, colleges, and universities where the students

are as a rule of more mature years) our prospective graduates, in our case prospective naval officers, spend a certain limited number of years of study in trying to cover the fundamental groundwork of a knowledge for the reasonable acquirement of which a lifetime of hard study is all too short. In the nature of things, then, the work at the Naval Academy must be extremely elementary and incomplete. That institution does all that it can hope to do if it teaches the midshipmen before graduation:

1. What branches of knowledge exists that are requisite or useful to a naval officer.

2. What the general nature of each such branch of knowledge is, and upon what general principles it is based.

3. From what sources knowledge in regard to each particular branch may be obtained.

4. How to gain such knowledge from these sources; that is, how to study effectively.

5. The desire to acquire knowledge, and a realization of the necessity for doing so.

6. In what way, in general, knowledge in each such branch will be useful to a naval officer, and how to start out to learn to apply it effectively in actual life.

Summarized, this means that an undergraduate education can do little more than furnish the student with an index of knowledge and a desire to further explore the field, together with some information as to how to conduct such explorations. Very little can be taught the undergraduate as to how to actually use knowledge; that ability can only come through further and deeper study, and as the result of experience. Some never realize this—and fail. Some realize it sooner and some later, and the later the realization comes, the harder it is to catch up. And the older a thoughtful officer grows the more fully he realizes that, struggle as he may, his actual knowledge will always be far, far less in proportion to the whole field to be covered than he would desire it to be. At times this realization may bring discouragement, but when this feeling manifests itself the solace lies in the appreciation of the fact that all others are in a like predicament, and that what brings success is not the amount of knowledge possessed expressed as a percentage of the whole field that ought to be covered, but whether that percentage of knowledge is higher than that pos-

sessed by one's competitors and, more important still, by one's possible adversaries.

## CHARACTER, WHICH INCLUDES THE POWER TO USE ABILITY

### CHARACTER IN GENERAL

From the several dictionaries that are accepted as standard, combining those detailed definitions that are pertinent to our present subject, we may for our present purposes deduce the following definition:

*Character*—The combination of qualities distinguishing any person or class of persons; the aggregate of distinctive mental and moral qualities belonging to an individual or race as a whole; the individuality that is the product of nature, education, habits, and environment; highly developed or strongly marked mental or moral qualities; individuality, especially as distinguished by moral excellence; good mental or moral condition. *Character* is what one is; *reputation* is what one is thought to be.

From this definition we see that when we say that a man is of a character suitable for command, we mean that he possesses to a satisfactory degree certain mental and moral qualities; and, as a general expression of these qualities, we may say that they are:

1. *Ability*, and the power to use it
2. *Strength*, mental, moral, and physical.
3. *Justness*.
4. *Tact*.

These four qualities will each be discussed separately, although it will be seen that there is no clearly cut line between them. The word *ability* has heretofore been employed as meaning *knowledge and the technical skill to use it*, and we now refer to the *power* to use ability, that is, to the element in character which furnishes the driving power that makes ability useful; which, in the last analysis, becomes a matter of strength of will and of character.

From a military and naval point of view we must also recognize the fact that, theoretically at least, the character of an individual may be regarded from two entirely distinct points of view; first, as to his possession of the qualities which will make him a



successful commander in a military organization and in military organizations and in military operations; and, second, as to what kind of an individual he is personally apart from his powers of command. In theory we can conceive of an individual who himself, in his immediate character, might be anything but an admirable character or honorable person, but who might nevertheless succeed to a high degree as a military commander. We therefore see that in our consideration of this topic we must recognize the existence of two theoretically separate entities, which are:

*Military character*, which may be defined as that phase of character which directly affects one's ability as a military commander, and

*Personal character*, which is that phase of character which affects the personality of the individual as a man, but which does not directly affect his ability as a military commander.

Of course there can be no such abstract separation; there is hardly any quality in a man's general character that would not directly affect both his military and his personal character. Rodney was a great naval commander, but a man of more than doubtful personal character, and in considering his case, as well as in that of many others, it has been found essential to satisfactory description and discussion to make at least a partial division of the character of the individual under the two headings given above.

#### MILITARY CHARACTER

The man who possesses high military character is therefore one in whom are to be found developed to a high degree the elements of character that directly and favorably affect his ability to command. It is difficult to set forth comprehensively and clearly what these elements may be, but a fair estimate may be made by stating the following qualities must be present in a high degree:

*Balance*—symmetry of mind; poise; evenness of mind.

*Accuracy*—exactitude; preciseness; ability of mind to receive impressions, assimilate them, and act upon them correctly.

*Judgment*—discrimination; nice perception; appreciation of difference; discernment; acuteness; penetration; wisdom; sapience; common sense; rationality; enlarged (broad) views;

wisdom in action; prudence; foresight; ability to differentiate between the practicable and the impracticable.

*Quickness*—acuteness of mind; ability of mind to receive impressions, assimilate them, and act upon them rapidly.

*Caution*—prudence; discretion; circumspection; foresight; vigilance; coolness; self-possession; presence of mind; watchfulness; not to be confused with timidity.

*Stability*—perseverance; firmness; constancy; steadiness; singleness of purpose; tenacity of purpose; persistence; patience; pertinacity.

*Resolution*—determination; will; decision; strength of mind; strength of will; firmness; stability; energy; manliness; vigor; courage—mental, moral and physical; zeal; devotedness; self-control; self-possession; self-reliance; self-government; self-restraint; self-denial; strength; perseverance; tenacity.

*Courage*—absence of fear; valor; resoluteness; boldness; spirit; daring; gallantry; intrepidity; contempt of danger; defiance of danger; audacity; dash; confidence; self-reliance; manliness; manhood; nerve; mettle; hardihood; fortitude; firmness; stability; resolution; prowess; willingness to take risks when necessary.

*Imagination*—originality; inventiveness; inspiration.

*Activity*—life; spirit; dash; energy; quickness; alacrity; promptitude; expedition; punctuality; eagerness; zeal; ardor; earnestness; industry; vigor; devotion; assiduity; painstaking energy; diligence; perseverance; vigilance.

\* *Ability to inspire*—power of rousing and inspiring others.

*Initiative*—power to act correctly on impulse generated within one's self.

*Integrity*—justice; justness; equity; impartiality; constancy; faithfulness; fidelity; loyalty; incorruptibility; trustworthiness; singleness of heart.

These numerous synonyms have been arranged as far as may be under the several heads indicated, but it will be noticed that they all more or less run together; that they all have more or less in common; which means, what we all know to be a fact, that character is a composite quality in which the elements have been fused into a common whole, and not a mere mechanical mixture

in which the many components have simply mingled without changing one another's character.

It will also be noted at once that practically every quality enumerated, *if possessed in too high a degree*, becomes not a virtue, not a desirable quality, but a fault in character; thus stability and resolution, if carried to excess, become obstinacy; courage pushed to an extreme; rashness, etc.

Of the qualities enumerated, that which the layman expects to find most strongly developed in an officer is *courage*, and this characteristic is therefore worthy of some special discussion, especially as that same layman is more than apt to think that, if an officer possesses mere physical courage, it is all that need be expected or required. To the civilian mind mere personal courage is very likely to cover a multitude of sins; but, while physical courage is of course a necessity in every man who is to take part in the operations of war, it is, unfortunately, far from being all that is required, or, for a man in high command, even the most important requisite; unfortunately, because of all forms of courage, mere personal bravery and disregard of danger are about the easiest qualities to find in men. There are two kinds of courage; *physical courage*, and *moral courage* or *courage of the mind*.

There are also two kinds of physical courage: first, that which is possessed by a man who by nature knows not fear; and, second, that shown by a man who, knowing fear, still shows personal bravery. Among the synonyms for courage that have been enumerated, we have two: *contempt of danger* and *defiance of danger*; the first phrase may well represent the courage of the man who knows not fear, and the second that of the man who, knowing fear, still shows bravery. While there are many who do not know fear, still their number is doubtless inconsiderable compared to that of those who show bravery in spite of their natural fears. It is not necessary to decide the question as to which of two such men is the more truly brave; but it may be pointed out that the first may have little or no moral or mental courage at all (as was Benedict Arnold), whereas the personal bravery of the second is based purely on such qualities of mind and soul. Also, the man who is contemptuous of danger, who naturally does not know what fear is, is more apt to be over-courageous; rash, lacking in judgment; than is he who, knowing danger and perhaps feeling fear,

nevertheless defies it and carries on his duties bravely and unhesitatingly, because of his high sense of duty, honor, and love of country, or other cause. The courageous man, who yet appreciates and reflects on danger and prepares himself to meet it, is the one who produces valuable results, while the rash and over courageous man performs acts of which it may be truly said: "*C'est magnifique; mais ce n'est pas la guerre.*"

Personal courage, the power to defy personal danger, is a common virtue, however, and never was this more conclusively shown than by the matter of fact way in which officers and men, very many of them absolutely green to the service and to sea life, went about their duties at sea during the late war, most of them in fear, no doubt, but all, almost without exception, in nonchalant disregard of the ever present submarine peril. Fear of the submarines no doubt existed in most hearts, but it led to vigilance and care, and not to fright or cowardice. So mere physical courage is the least uncommon form of that quality; the one which we can always count upon, barring low morale or some sudden temporary panic generally resulting from such lower resisting powers. Harder to find are the men who possess *moral* and *mental* courage; the strength of character and will that enables them to assume and bear responsibility in times of stress and danger; and this quality is absolutely necessary in an officer who is to exercise the higher command. And not only must such commander have this moral courage and strength of character, but he must also be able to bear equably and without detriment to his other qualities, the strain that responsibility throws upon him. Unless he can do this with a confident bearing, concealing any doubts and fears that may beset him, he cannot expect to maintain the confidence and morale of his force. Napoleon almost without exception failed to find admirals who possessed this most necessary quality: "poltroon of mind, though not of heart," he called one of them.

#### PERSONAL CHARACTER

Personal character is that phase of character which exerts no direct influence, or no influence at all, upon the ability of the individual as a military commander. Probity in financial affairs, morality in the limited and technical sense of the word, etc., may

be mentioned as the most prominent features of personal character. Even temper, a sympathetic disposition, etc., are other such qualities. With the personal qualities of the individual, so long as they are strictly personal only, we have little to do, but so rare is it the case that personal character does not markedly affect military character, that in our estimation of any individual we must consider personal as well as military character, and in education, training, environment, and in governing the formation of habit, we must give great attention to the creation of high personal as well as high military character.

RECIPROCAL EFFECT OF MILITARY AND PERSONAL CHARACTER  
UPON EACH OTHER

We have just noted that military and personal character cannot really be separated; that one affects the other. Therefore if we wish to build up one we must build up the other. In the definition we find that character, among other things, is *the individuality which is the product of nature, education, habits, and environment*. That is, in each individual, nature provides, congenitally, a certain field for development; and the resultant character depends, first, upon the qualities inherent from birth, and, second, upon education, habits, and environment. Now these last three forces must be applied to the individual as a whole; they cannot touch the formation of military character without touching that of personal character as well; and from this fact flows the reasoning that prompts us to safeguard the personal character of the recruit and of the younger officer and midshipman; to educate them generally as well as in strictly naval matters, and to guard their environment and their formation of habits. A bad personal habit must reproduce itself in some form in military habits; a poor environment as to personal character will lead to poor personal habits, which will in turn surely become incorporated into the military habits of the individual. The sin of personal laziness is perhaps typical of this process; natural disposition and environment create this bad personal habit, and this very soon becomes transmuted into military sin of lack of zeal and industry and its kindred faults.

No better examples of the effect of personal character upon military character can be given than those of Rodney and Nelson.

For a full analysis of these cases see Mahan's *Types of Naval Officers* for the former and *Life of Nelson* for the latter. It is enough to say here that Rodney allowed his personal interest in certain financial transactions to seriously affect his performance of duty as an officer; whereas Nelson in a marked degree, in his earlier days at least, subordinated all personal considerations to the demands of duty, even at much cost and trouble to himself. In his later days Nelson, under the evil influence that more or less controlled him, showed in himself a similar difference, as contrasted with the Nelson of the earlier days.

#### REMARKS ON THE QUALITIES OF MILITARY CHARACTER

While space does not permit the effort to illustrate the need for each of the qualities enumerated as requisite for high military character, some few discursive comments and illustrations will not be without interest, and it is hoped may be permitted.

Of all the qualities of mind enumerated, which, if any, can be said to be the most important? There can be no positive answer to this question, any more than there can be to the query as to whether the motive power or the armament of a ship is the most important; but in considering it there is to the writer a strong temptation to say that, given other qualities in a reasonable degree, *quickness*, or rather, *accurate quickness*, is of the first importance; for a naval officer with a slow mind is an annoyance to himself and a thorn in the flesh to his seniors.

An excellent example of proper stability of mind was shown by Admiral Togo during the Russo-Japanese war, while he was waiting in the Straits of Tsushima for the arrival of the second Russian fleet. When that fleet was very slow in arriving and when his scouts failed to find it as anticipated, there was very strong pressure brought to bear upon him from others, many of them of very high rank (doubtless his own mind also strongly urged him in the same direction) to act on the assumption that the enemy had gone to sea with a view to approaching Vladivostok through the Straits of Tsugaru, thus avoiding the Japanese fleet at Tsushima. Togo withstood all such pressure, feeling that his estimate that the Russians would pass through the Sea of Japan must be right, and while not neglecting other precautions, he

clung firmly to the belief that seemed to him to be logical and right, with results that are known to the world.

#### STRENGTH OF CHARACTER

In our consideration of character were enumerated many qualities of mind and soul that are essentials of high military character. Looking back again at those essentials we see that they represent in general: first, the high impulse from within that tells an officer wherein his duty lies and inspires within him the desire to perform that duty to the highest possible degree; and, second, the driving power or force which enables him to move steadfastly and resistlessly in response to the call of duty thus presented to him. In some lights the terms *strength of character* and *high military character* may be regarded as synonymous, but again there is a fine shade of difference in definitions. High military character involves strength of character, it is true, but it might perhaps be justly argued that in high military character there are other elements than strength. Be that as it may, there is no doubt that strength of character involves the strength to decide correctly and in accordance with the highest dictates of honor and patriotism, and therewith the power to carry out and enforce the decisions thus made. And this power must be of a two-fold nature, for not only must an officer have within himself the power to carry out his decisions by causing his subordinates to think and act loyally and effectively in accordance with his will and purpose, but he must be able to achieve also the often far more difficult victory of driving himself along the path of duty. No doubt habit, training, every instinct of an officer, will lead him along the path of duty, but even to the strongest and best there come times of inertness, of lethargy, of discouragement, of hesitancy and doubt; of what not enemies to strength and vigor; times when the temptation to relax effort, to avoid decision, to aim something short of one's full duty, is almost overpowering. It is in these moments that strength of character comes to the rescue; for then its possessor, buoyed up by the power and spirit that are within him, moves unswervingly along the path of duty, and what is equally important and perhaps even harder—for he who holds high command is necessarily a lonely soul in his moments of extreme trial—does it calmly and quietly, and with

a smiling and unwavering face and bearing, in order that none about him may perceive the doubts that are within. This is strength of character in its military sense at its best; and without it no man can hope for success in high command.

#### PHYSICAL STRENGTH, AND ITS EFFECT UPON STRENGTH OF CHARACTER

From what has just been said of the need of strength of character it will necessarily be seen that physical strength is a very great asset also, for it is well-nigh impossible for any man to make the efforts of mind and will just described if he be at the same time struggling with physical weakness, and physical weakness is therefore more than apt to affect strength of mind and of character unfavorably. Some historical examples, notably that of Nelson, are often cited to show that a man can be a great commander; can possess great strength of mind and of character; even though lacking in physical strength, or even when actually the victim of almost constant physical suffering. This is no doubt true, but we must certainly consider such cases as very exceptional. And who can know to what degree his physical weakness may have been responsible for the not infrequent shortcomings of Nelson in both judgment and action? Also, as history does not record them as great, who can say how many and what men, otherwise well qualified to command, failed because of physical infirmities and of their effect upon their character and powers? There are cases in which men who have already proved themselves great have in their actions shown the result upon their strength of character of physical infirmity due to age. One of these was Lord Howe, a man noted for his strength and equanimity of character, at the time of his great battle of June 1, 1794, at which time he was sixty-eight years of age. This battle was fought after four days and nights of almost continuous maneuvering, with several partial engagements, during which the English attempted to gain the weather gage originally held by the French, and succeeded, and during which Lord Howe was unable to get any rest except such as could be taken in an arm-chair. By the time the battle ended he was utterly exhausted and had to be helped to his cabin, and failed to follow up his victory to the utmost; being encouraged in this failure by his chief of staff.



In narrating the events of this action Mahan speaks of this, and infers that it would undoubtedly have been Lord Howe's impulse to pursue had not his physical infirmities practically disabled him for the moment. Speaking of this, Mahan says:

" . . . In truth, it was impossible for Howe to purpose otherwise (than to pursue). Having been continuously what he was in his prime, it could not be that he would not intend, with all the force of his will, to persevere to the utmost in the duty before him. The faithfulness of a lifetime does not so forsake a man in his end. What he lacked at that critical hour was not the willing mind, but the instrument by which to communicate to the fleet the impulse which his own failing powers were no longer able to directly impart."

Strength of character may therefore overcome physical weakness at times, but as Mahan has said in a passage previously quoted, even when this be done successfully, the effort to accomplish it must necessarily be a drain upon a man's total resources of soul, which must perceptibly detract from his total power of accomplishment.

#### POWER TO USE ABILITY; THE "WILL TO ACHIEVE"

Performance has been said to depend upon several qualities: first, ability—that is, knowledge and the technical skill to use it; second, high military and personal character—which furnish qualities necessary for effective action; and third, strength of character, of mind, of soul, and of body. This last, strength, has been considered in part as an element of character, and such it is; but beyond that, its importance is so great that it may well be considered as an element of command in itself. Its first action is to inspire in the individual the "*will to achieve*," and to do this it calls upon a number of motives, personal, perhaps selfish, as well as altruistic. Ambition, for one's self and for one's service and country; loyalty to country, duty, service, and to one's immediate commander; and perhaps other motives; all combine to inspire this "*will to achieve*." This is the mainspring of all action, for under its impulse the commander acts, first to determine his duty and what his actions should be to perform it, and then to act accordingly.

## JUSTNESS

To denote the quality which it is now desired to discuss, the word *justness* has been taken rather than the more common word *justice*, for the reason that, while the dictionary definitions of the two words are in general form the same: namely, "the quality of being just," nevertheless *justice* is most frequently understood in its restricted and secondary definition, as being "the administration of the law." Unless capable of administering absolute justness, a commander will fall short of perfection by just so much as he fails in this respect, and will correspondingly fail to inspire in those around and under him the high degree of morale and loyalty without which no commander can hope to be successful. While the word *justness* as used includes legal and military *justice*, in other words justness in the administration of discipline, that phase is by no means all; in fact it is in reality a lesser aspect of the broad question. Justness in personal relations, sympathy with others, tact, etc., are all essential elements of justness in its truest and best sense. And, what is too often forgotten, justness means, not only nor even mainly, the disciplining of those who fail or offend, but to a much greater degree the encouragement and commendation of those who do well. An officer who is quick to rebuke but slow to commend is essentially and fundamentally unjust, and such an one can never secure from his subordinates the highest degree of loyalty, morale, and efficiency; can never hope to win from those whom he commands the "last touch that cannot be commanded but can only be given"; that "free contribution of the man to his defined duty" of which Professor Hocking speaks.

## TACT

Tact is a somewhat intangible asset and correspondingly hard to define, but it is nevertheless the binder whereby the qualities requisite for command of personnel are unified and made effective in all dealings with those under one's command; without it the value of all other qualities is very greatly reduced. It may be said with confidence, however, that unless tact be based on justness it will be valueless; officers and men are quick to detect the defective character of an outwardly tactful bearing and of actions that do not contain within themselves the essentials of justness.

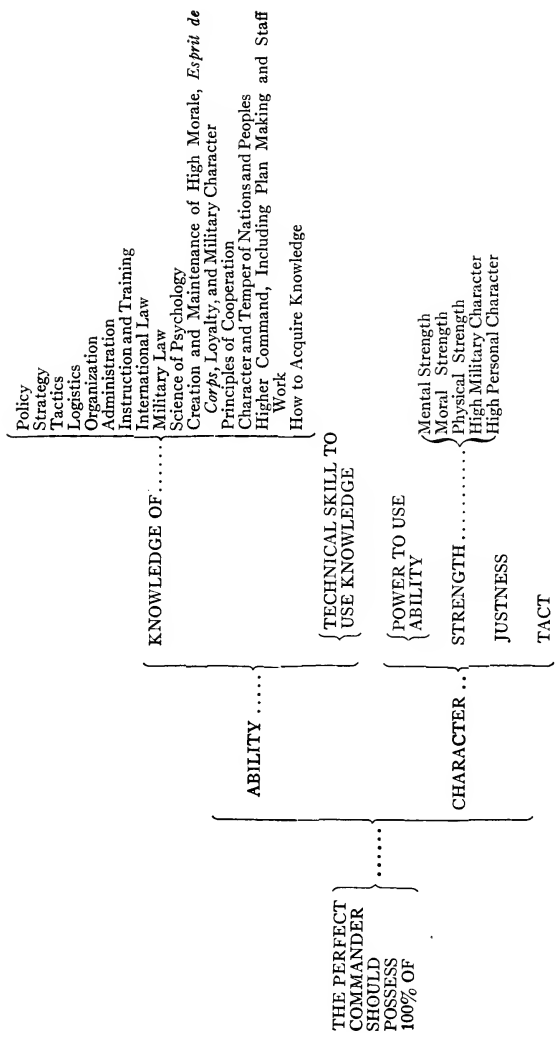
Mere outward and superficial tact; such tact as is often displayed on social occasions; while perhaps creating a favorable prepossession in the first stages of acquaintanceship or of official relationship, will not carry far if it be merely on the surface; and when lack of sincerity is once detected such tact becomes, not an asset, but a constant and most irritating cause for offense and discontent. Whatever be the motives prompting the employment of a tactful bearing and of tactful actions, if they be not based on natural feelings and a sympathetic nature; if they be based on an acquired and not upon a natural habit; if they be exercised only to accomplish certain results ("for what there is in it"); the hollowness of the pretense will soon be discovered, and as a result bad, and not good, consequences will follow.

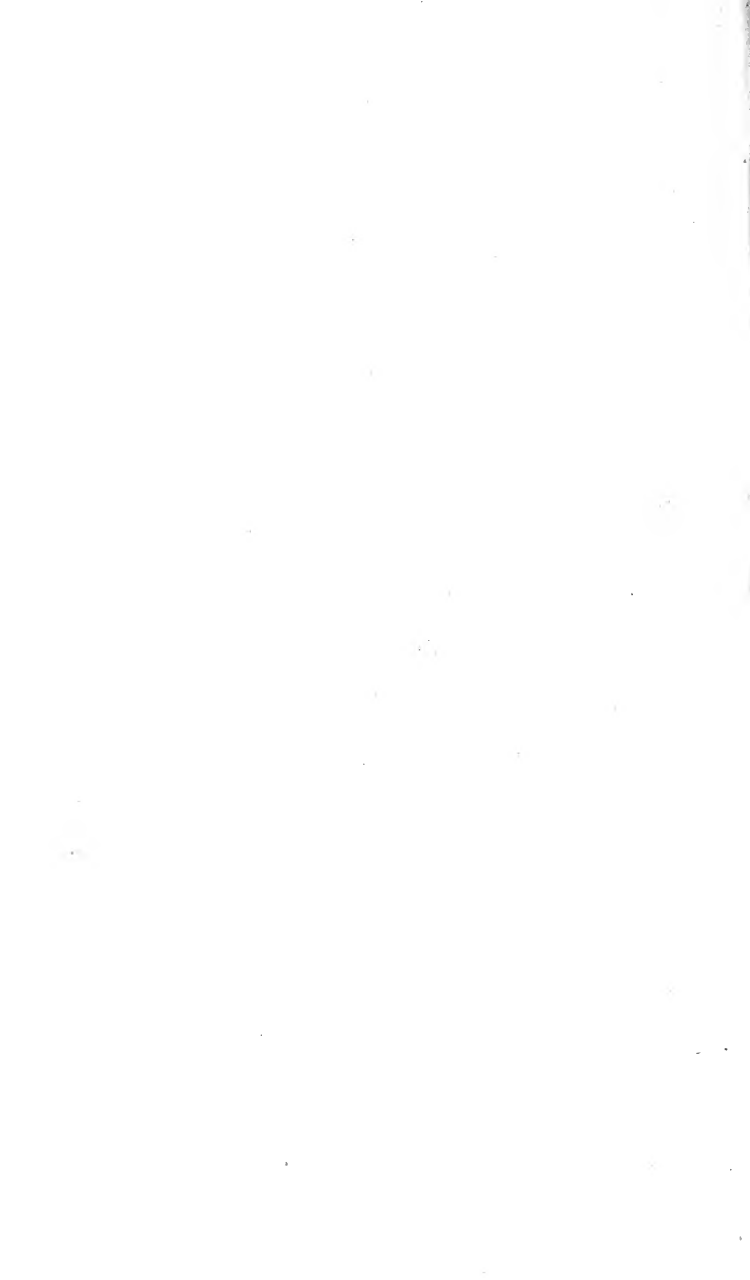
#### SUMMARY OF REQUISITES FOR COMMAND

Having now analyzed the principal requisites for successful command, and segregated and discussed the major principles underlying them, it becomes possible, as a summary, to construct the character of an officer in high command as it should be. The appended diagram shows the requirements that have been considered in the preceding pages, but even with that, all is not said, for in discussing the perfect man, whether in general or as an officer, there are so many fine shades of meaning that enter, so many elements that must be present, that we can only despair of reaching anything more than reasonably accurate general conclusions. For instance, we have noted certain qualities as requisite, and have pointed out that the possession of certain, if not all, of these qualities in too high a degree, become positively detrimental. Where does self-confidence become self-conceit, and transform itself from a necessary quality into one which blinds its possessor to many things that he should see and appreciate, and thereby lead him into egregious errors? This, and many other similar questions, can receive no concrete answer; and, because this is the case, the subject can never be covered in a thoroughly satisfactory manner. Nor is it believed that the qualities enumerated cover everything that is requisite; probably every reader of this thesis will think of something that has been omitted; so the writer can only say that he fully realizes the incompleteness of this paper, in spite of its length, and the fact that many points

worthy of great elaboration have been touched upon but lightly, if at all.

It may be deduced at once from the statement of the requirements that no man can ever be a perfect commander; it is evident that omniscience alone could accomplish this; and the men whom history has recorded as the greatest each appears, when his life, character, and actions are closely analyzed, as falling short of the perfect standard in many respects. This is true of the man who probably stands highest of all in naval reputation, Nelson; and if failure to attain perfection exist in even the greatest of whom history teaches, there is little chance that the future will ever produce the perfect commander. That this is true need cause no discouragement to the officers of our service, for, as has already been said, what is true for us is equally true for others, and, while we realize that we must always fall far short of what we would wish to be, at the same time the officers of other navies are in a like predicament. Therefore it is our duty, while striving to reach the highest degree of perfection, attainable, not to be discouraged by our own shortcomings *so long as we can feel assured that such shortcomings do not exceed those of officers of any other navy*. While we cannot hope to be perfect, we can, if we bend our entire strength to the effort, feel reasonably sure that we will not be surpassed by those who may come up against us, and may hope that we may exceed the majority in excellence; it is to this end that every officer of our navy should exert himself unremittingly and to the utmost.





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## WE, THE PEOPLE, AND THE TREATY POWERS OF OUR GOVERNMENT

By COMMANDER J. O. FISHER, U. S. Navy

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The League of Nations was rejected by the Senate. A Conference for the Limitation of Armaments is under way. What are the restrictions on that Conference? How will its decision be ratified? What are the treaty-making powers delegated in the Constitution by the words:

He (the President) shall have power, by and with the advice and consent of the Senate to make treaties, provided two-thirds of the Senators present concur.

Is that delegated authority the "Sovereign Power which relates to Treaties and Agreements with foreign nations" in the United States? These are questions which must be answered to give any agreement authority under our Constitution. For instance, can the authority delegated above regulate tolls for American shipping using the Panama Canal?

The treaty-making power delegated by the Constitution to the President and Senate is a limited power.

The treaty-making power delegated, by the People, to all departments of the Government established by the Constitution, is not the equivalent of the "Sovereign Power which relates to Treaties and Agreements" in many countries.

The power to make treaties, "in its utmost plenitude," rests solely in the People of the United States.

The treaties and treaty-making powers are referred to several times in the Constitution and each reference adds to, or subtracts from, the treaty-making power delegated as above.

The power to make treaties under the Constitution was a development of our experience under the Articles of Confederation

of the Thirteen States. Treaty-making and membership in an Agreement is not a new or novel experience for the People of the United States.

A review of that experience should be of interest, and, in combination with an examination into the treaty-making powers delegated under the Constitution, will demonstrate conclusively the necessity for the submission of most treaties with other nations to "We, the People," as represented by Congress, and in a few cases as an amendment to, and in the manner provided by, the Constitution.

Article III of the Articles of Confederation reads:

The said states hereby severally enter into a firm league of friendship with each other, for their common defense, the security of their liberties, and their mutual and general welfare, binding themselves to assist each other against all force offered to, or attacks made upon them, or any of them, on account of religion, sovereignty, trade, or any other pretense whatever.

This is not quite as ambitious in intent as several treaties and agreements proposed in the last few years. It was made or entered into during war on a common enemy. It is a defensive league. It is of interest as defining the intent of the Thirteen States under the Articles of Confederation and as demonstrating that agreements, leagues and alliances between several nations are not a new and novel experiment in our history.

Another of the Articles of Confederation reads:

Each State retains its sovereignty, freedom and independence, and every power, jurisdiction, and right, which is not by this Confederation *expressly* delegated to the United States in Congress assembled.

The Thirteen States recognized that a League could not be effective without powers, but at the same time, they were determined to give few powers and required that these be expressly delegated, that is, in words meaning just that, without the aid of inference, and susceptible of no other meaning.

The States entered this League of Friendship, not the People of the States. The States retained all sovereign powers except those expressly delegated, and when they obtained their independence they would have severally acquired the sovereign powers previously held by Great Britain.



In the Federalist Papers we find the "League of Friendship" established by the Articles of Confederation, examined from all angles and in most thorough detail.

The United States had an indefinite discretion to make requisitions for men and money; but they had no authority to raise either, by regulations extending to the individual citizens of America.

There was no penalty annexed to disobedience, the resolutions or commands which pretended to be laws were, in fact, nothing more than advice or recommendation.

One of the objections to penalties as applied to States which did not act in accordance with the recommendations made under the League of Agreement was:

A penalty can be inflicted by the agency of the courts and ministers of justice or by military force; by the coercion of the magistracy, or by the coercion of arms. The first applied only to men. The last must be employed against bodies politic, or States, and then every breach of the agreement must involve a state of war; military execution becomes the only instrument of civil obedience.

The interposition of the State legislatures was necessary to give effect to a measure of the Union, and they had only *not to act*, or to *act evasively*, and the measure was defeated.

It has not a little contributed to the infirmities of the existing federal system (i. e., Articles of Confederation), that it never had a ratification by the PEOPLE. Resting on no better foundation than the consent of the several legislatures (i. e., of its component States), it has been exposed to frequent and intricate questions concerning the validity of its powers. (Federalist letter from the New York Packet, December 14, 1787.)

The possibility of a question of this nature proves the necessity of laying the foundations of our national government deeper than in the mere sanction of delegated authority. The fabric of American empire ought to rest on the solid basis of THE CONSENT OF THE PEOPLE. The streams of national power ought to flow immediately from that pure, original fountain of all legitimate authority. (Same reference as preceding paragraph).

With this previous experience, the United States should carefully examine all treaties, agreements, alliances and leagues and insist that each be rid of those defects which were remedied in

the Federal Constitution ordained and established by "We, the People of the United States of America."

The consent of the People was the paramount omission in the League of Friendship. Will any agreement for the limitation of armaments be submitted to the People? Is such consideration necessary? Have the People delegated the power of ratification to the Government of the United States under the Constitution?

These are questions which can best be answered by those in whom the People of the United States have confidence. A confidence, resting not on the opinion of the moment, but on accomplishment, tested by Time. It is in the written record which Washington and Lincoln left, that guidance will be sought.

George Washington, when offering the office of Secretary of State to Patrick Henry under date of 9 October, 1795, commented on his foreign policy for our new republic as follows:

My ardent desire is, ..... to keep the United States free from political connections with every other country, to see them independent of all and under the influence of none. In a word, I want an American character, that the powers of Europe may be convinced we act for *Ourselves*, and not for others.

An examination of the powers delegated under "We, the People of the United States, . . . . do ordain and establish this Constitution for the United States of America" to demonstrate that the Constitution does consist only of powers delegated by the People of the United States is very easy and certain. The people have Washington's words to Lafayette "That the general Government is not invested with more powers, than are indispensably necessary to perform the function of a good Government; and consequently, that no objection ought to be made against the quantity of power delegated to it." Washington again affirms his belief in the powers of the People in these words:

The power under the Constitution will always be in the People. It is entrusted for certain defined purposes, and for a certain limited period, to representatives of their own choosing; and whenever it is exercised contrary to their interest, or not agreeable to their wishes, that their servants can and undoubtedly will be recalled.

In an examination and interpretation of the Constitution, the People have the guidance of Lincoln, who preserved the Constitution and the Government, when judicial interpretation of the

Constitution by a bare majority of a divided court had involved our United States in Civil War.

Lincoln in his masterly speech at Cooper Union and in reference to the Dred Scott decision of the Supreme Court said:

When I say the decision was made in a sort of way, I mean it was made by a divided court by a bare majority of the judges, and they not quite agreeing with one another in the reasons for making it; that it is so made as that its avowed supporters disagree with one another about its meaning, and that it was mainly based upon a mistaken statement of fact . . . the statement in the opinion that the right of property in a slave is distinctly and expressly affirmed in the Constitution.

An inspection of the Constitution will show that the right of property in a slave is not distinctly and expressly affirmed in it. Bear in mind the judges do not pledge their judicial opinion that such a right is impliedly affirmed in the Constitution; but they pledge their veracity that it is distinctly and expressly affirmed there—distinctly, that is, not mingled with anything else—expressly, that is, in words meaning just that, without the aid of any inference, and susceptible of no other meaning.

If they had only pledged their judicial opinion that such right is affirmed in the Constitution by implication, it would be open to others to show that neither the word slave nor slavery is to be found in the Constitution, nor the word property even, in any connection with the language alluding to the things slave, or slavery, and that wherever in that instrument the slave is alluded to, he is called a person; and wherever his master's legal right in relation to him is alluded to, it is spoken of as service or labor due, as a debt payable in service or labor. Also it would be open to show, by contemporaneous history, that this mode of alluding to slaves and slavery, instead of speaking of them, was employed on purpose to exclude from the Constitution the idea that there could be property in man. To show all this is easy and certain."

In his plain and simple analysis of a judicial decision, Lincoln had made clear a method of interpretation of the Constitution of the United States of America.

The "upright intentions" of the People of the United States are clearly stated in the preamble as being "to form a more perfect union," "to establish justice," "to insure domestic tranquility," "to provide for the common defense," "to promote the general welfare," "to secure the blessings of liberty to ourselves and our posterity." The language is clear. The intentions specified are distinctly and expressly domestic. Other nations are not mentioned, except that "to provide for the common defense" refers, by implication, to them.

The Constitutional Convention met at Philadelphia on 25 May, 1787, and George Washington was unanimously called to the chair as president. The Constitution received the assent of the Convention on 17 September, 1787. In his letters covering this period, Washington always refers to the business of the Convention as a question of government for the Union, "that all who live under it may be secure in their lives, liberty, and property."

From Washington's letters, from the wording of the Constitution itself, the clear intent was to establish a government.

Weak at home and disregarded abroad is our present condition (i. e., under the Articles of Confederation of the United States of America), and contemptible enough it is,

is a statement by Washington written during the sitting of the Convention.

Surely at this time and under these conditions the establishment of a domestic government was no small undertaking. How ridiculous, in view of the fact that we were "disregarded abroad" would have been the intention to provide for entry into a world agreement of any kind.

The intent of the People of the United States expressed in the Constitution has not been changed. A method for its amendment was provided and has been available.

"Their own power over their own instrument remains. But until they shall alter it, it must stand as their will, and is equally binding on the General Government and on the States," are the words of Daniel Webster.

The first ten amendments were proposed during the first session of the Congress and were ratified 15 December, 1791, the series being in the nature of a "Bill of Rights."

We have the Federalist on a "Bill of Rights" as follows:

Here (in the Constitution) in strictness, the People surrender nothing; and as they retain everything, they have no need of particular reservation. . . . For why declare that things shall not be done which there is no power to do?

Washington's opinion of the Federalist was:

That work will merit the notice of posterity because in it are candidly and ably discussed the principles of freedom and topics of government.

The Federalist and the Constitution established as new principles of Government:—"That the Government has powers only as

they are delegated by the People" in place of the centuries-old principle of oppression—"That the People have rights only as they are granted by Kings and Governments.

Washington, in a letter to Lafayette on politics, dated 28 April, 1788, states:

There was not a member of the Convention, I believe, who had the least objection to what is contended for by the advocates for a "Bill of Rights", . . . where the people evidently retained everything, which they did not in express terms give up, . . .

Included in the "Bill of Rights" to which not a member of the Constitutional Convention objected, was the Ninth Amendment, reading:

The enumeration in the Constitution of certain rights, shall not be construed to deny or disparage others retained by the people.

We have Washington's word that he believed there was not a member of the Convention who had the least objection to this amendment or to the others included in the "Bill of Rights"—"where the people evidently retained everything, which they did not in express terms give up." Without a single objection, among the members of the Convention, this principle was admitted. For the people to retain everything would include all powers not delegated in express terms, that is, in words meaning just that, without the aid of any inference and susceptible of no other meaning.

The Tenth Amendment is a re-affirmation of the powers reserved to the People and an affirmation of those reserved to the States, respectively. It reads:

The powers not delegated to the United States by the Constitution or prohibited by it to the states, are reserved to the States, respectively, or to the People.

Therefore, in support of a strict interpretation of the Constitution which requires a distinct and express delegation of powers by the People we have, first, Washington's statement of the attitude of members of the Constitution Convention toward the "Bill of Rights." Second, we have the Federalist on the "Bill of Rights." Third, we have the Ninth Amendment. Fourth, we have the Tenth Amendment. Fifth, we have the Principle of Government established by the Constitution that "the Government has powers only as they are delegated by the People."

It is submitted, that the delegation of implied powers under the Constitution is wrong in principle and is repugnant to the clear intent of that Instrument.

The Constitution expressly delegated the power to make treaties, as follows:

He (the President) shall have power, by and with the advice and consent of the Senate, to make, treaties . . ."

The Constitution expressly prohibits powers to the States, as follows:

"No State shall enter into any treaty, alliance, or confederation . . ."  
and "No State shall, without the consent of Congress, . . . enter into any agreement or compact with another State, or with a foreign power, . . ."

No construction is necessary here. The Constitution declares distinctly and expressly that "no State shall enter into any treaty, alliance, or confederation." It is clear that "any" includes "treaties, alliances, and confederations" of all kinds and degree.

These powers in regard to treaties, alliances, confederations, compacts and agreements are not delegated to the United States by the Constitution in the express and distinct terms with which they are prohibited to the States.

Entry "into any treaty, alliance or confederation and any agreement or compact" is prohibited and it is plain that any treaty, alliance, confederation, agreement or compact is more comprehensive than "treaties," and consequently certain power relating to treaties are retained by the People.

Hamilton in the Federalist of 14 March, 1788, said:

The King of Great Britain is the sole and absolute representative of that nation in all foreign transactions. He can of his own accord make treaties of peace, commerce, alliance, and of every other description. . . . Every jurist of that kingdom, and every other man acquainted with its constitution, knows, as an established fact, that the prerogative of making treaties exists in the crown in its utmost plenitude . . . independent of any other sanction. . . . But this parliamentary interposition proceeds from the necessity of adjusting a most artificial and intricate system of revenue and commercial laws, to the changes made in them by the operation of the treaty; . . . In this respect, therefore, there is no comparison between the intended power of the President, and the actual power of the British sovereign. . . . If the Confederacy were to be dissolved, it would become a question whether the Executives of

the Several States were not solely invested with the delicate and important prerogative.

The sole and absolute right of the King of Great Britain in foreign transactions has no existence in our Government of delegated powers.

The sovereign power which relates to treaties, in Great Britain was "the prerogative of making treaties which exists in the Crown, in its utmost plenitude." This sovereign power would have rested solely in the executives of the several states if the Articles of Confederation had been dissolved.

However, the Articles of Confederation between the States was replaced by the Constitution for the United States of America, ordained and established by the People of the United States. Some of this sovereign power which relates to treaties was prohibited the States, some was delegated to Congress, some was delegated to the President and some was delegated to the Supreme Court. It is clear that the intention was to impose limits on "the sovereign power which relates to treaties and agreements with foreign nations" as evidenced above and that the People reserved the Powers not delegated.

Treaties and agreements may cover all subjects within the control of a "sovereign government." Our Government, however, is a government of delegated power only. It is divided into three distinct and separate departments, the Legislative, Executive, and the Judicial. Powers are delegated to each to perform its part in the scheme of government as a whole. The power to make treaties and agreements of all kinds and descriptions is greater than that delegated to any branch of the government or to them all collectively. The principle is repugnant to a Constitutional Republic.

The power to make treaties and agreements implies the right to make laws since the treaties are to be the supreme law of the land, but, the Constitution expressly states that ALL legislative power is delegated to Congress.

The prohibition of entry into any agreement or compact with any other state or with a foreign power, is limited for each and every State by the words "without the consent of Congress." It does not state, without the consent of the treaty-making power, or without the sanction of the judicial power, but it states dis-

tinctly and expressly "without the consent of Congress." It is clear from this that the power prohibited to the States, of entry into agreement and compacts with a foreign nation, was considered to come more within the powers delegated to Congress than any other branch of the Government, including the treaty making power itself.

The Constitution provides that "all treaties made or which shall be made under the authority of the United States, shall be the supreme law of the land." They must be made under the authority of the United States. The President and two-thirds of the Senate constitute only a part of "the authority of the United States."

The Constitution provides that "the Judicial Power shall extend to all cases in law and equity arising under this Constitution, the laws of the United States, and the treaties made, or which shall be made, under their authority."

Power is delegated to the President and the Senate from the same source, i. e., "We, the People," which delegates all the legislative power to the Congress and which vests the judicial power in the Supreme Court.

The clear inference from this is that the treaty-making power delegated must not infringe the legislative or judicial power expressly and distinctly delegated.

The delegation of the legislative power, is expressed as "All legislative powers herein granted shall be vested in a Congress" but under that same article in the Constitution, power is expressly and distinctly delegated to Congress "*to regulate commerce with foreign nations, and offenses against the law of nations; to declare war; to raise and support armies.*"

From these distinct and expressed powers of Congress, it is clearly and plainly the intention of the Constitution to delegate to Congress powers which are sometimes included in the "sovereign power which relates to treaties."

The legislative power expressly and distinctly granted also requires that "Congress shall have power to make all laws which shall be necessary and proper for carrying into execution the foregoing powers and all other powers vested by this Constitution in the Government of the United States, or in any department or officer thereof."



"The foregoing powers and all other powers vested" are the words used. "All other powers" means all powers additional to the legislative powers listed previously in that section and article of the Constitution.

Among all other powers vested by the Constitution, etc., is the power to make treaties. Provided this phrase read "all powers vested by this Constitution," etc., the power to make treaties would still be included. It reads, however, "All other powers," etc., which means, all powers, not the same, or additional, to the specific legislative power vested by the Constitution.

This provision of the Constitution expressly and distinctly refers to other powers, as additional and not included in the legislative power and places the authority in Congress "to make all laws which shall be necessary and proper for carrying into execution all powers vested by this Constitution in the Government of the United States or in any department thereof."

The treaty-making power is vested in a "department of the Government of the United States" and treaties made by the President and Senate are dependent on Congress for laws to execute them. Therefore, the express and distinct intent is that powers vested in Congress shall limit the delegated power vested in the President and the Senate to make treaties, and treaties so made, shall not infringe the distinct and express legislative power delegated to Congress.

In reading the Federalist on the powers to make treaties, it is apparent that the treaty-making power delegated to the President and the Senate should not give them the power to do every other act of sovereignty in treaty relations by which the citizens are to be bound and affected.

The second amendment to the Constitution, included in the "bill of rights," to which reference has been made previously, reads: "a well regulated militia being necessary to the security of a free state, *the right of the people to keep and bear arms* shall not be infringed." The first sentence in this article is a statement of truth or principle as accepted by the first Congress.

*Was the right to raise and support an army exposed to infringement by the treaty-making power delegated to a department of the Government?* It is absurd to imagine that a people who would not delegate their right to keep and bear arms to their Govern-

ment, should deliberately place *in a department of that Government, the right to make treaties, which could limit or disparage the right to raise and support armaments.*

In the Federalist, Hamilton states:

There is nothing absurd or impracticable in the idea of a league or alliance between independent nations for certain defined purposes precisely stated in a treaty regulating all the details of time, place, circumstances, and quantity; leaving nothing to future discretion; and depending for its execution on the good faith of the parties. (Federalist letter No. 15—For the Independent.)

Treaties are made between independent nations. The purpose of a treaty must be defined. These purposes can include a league or alliance. All details of time, place, circumstances and quantity must be precisely stated. Nothing in a treaty can be left to future discretion. A treaty depends for its execution upon the good faith of the parties and the use of force against any party to the treaty is repugnant to the idea of a treaty. This is the idea of a treaty as the word was used in the Constitution for the United States of America.

The purpose of any agreement for the reduction of armament must be defined. What is that purpose?

The Second Amendment to the Constitution reads: "A well regulated militia being necessary to the security of a free state, the right of the People to keep and bear arms shall not be infringed."

It is not clear how any agreement for the limitation of armaments can have any purpose which is not a violation of the Second Amendment quoted above, or of the distinct and express power delegated to Congress "to raise and support Armies."

The treaty-making power delegated in the Constitution to the President and the Senate is not sufficient to enter a World Agreement for the Limitation of Armaments. It is not even the equivalent of the "Sovereign powers which relates to treaties" of other nations. It was so limited with clear and well defined ideas of the functions of treaties and agreements and their purposes by the Framers of our Constitution.

It therefore must be approved by Congress, and if it applies to State militia it must be submitted to "We, the people."

It does not delegate expressly and distinctly the power of entry into any agreement.

It is limited by the statement that the power prohibited to the States, is, "entry into any treaties, alliances or confederations;" the power delegated is, "to make treaties." The difference between the powers delegated and the powers retained is reserved to the People.

The treaty-making power is further limited by the prohibition to the states of entry into any agreement or compact with a foreign power without the consent of Congress.

It is limited by the granting of all legislative power under the Constitution to Congress.

It is limited by the distinct and express delegation of power to Congress to "raise and support armies."

It is limited by vesting the judicial power in all cases in law and equity under treaties made, in the Supreme Court.

It is limited by specifying that all treaties made under the authority of the United States (i. e., not a department of the United States) shall be the Supreme Law of the Land.

All these limitations operate to decrease the sovereign powers delegated, which relate to treaties.

At the time of the Constitutional Convention, leagues, alliances, federations, agreements, compacts, and their nature was known and understood as noted by the Federalist papers. The idea of a world agreement for the limitation of armaments was not at that time in existence. Our Government was instituted for certain purposes distinctly and expressly affirmed in the preamble to the Constitution. The intention was domestic only.

The powers delegated under the Constitution were delegated for the purpose distinctly and expressly affirmed.

The power of entry into any agreement for the limitation of armaments was not delegated. It has not been delegated.

The sovereign power which relates to treaties rests with "We, the People of the United States." Its assumption to enter into any agreement for the limitation of armaments is not impliedly affirmed by the Constitutional powers which were delegated "to effect a more perfect union, . . . and secure the blessings of liberty to ourselves and our posterity." It is distinctly and expressly negated by the Second Amendment to the Constitu-

tion which reads: "A well regulated militia being necessary to the security of a free state, *the right of the people to keep and bear arms shall not be infringed.*"

Assumption of power by the Government is repugnant to the institutions of our republic. It is abhorrent to the principles of Government of the People, by the People, and for the People. It repudiates the wisdom of Washington and ignores the teaching of Lincoln.

The American People will do well to remember Washington's words that:

When a People shall have become incapable of governing themselves and fit for a master, it is of little consequence from what quarter he comes.

If and when, "We, the People" of the United States desire to amplify the clear intent of the Constitution, or the powers delegated thereunder to the Government of the United States, a method is provided in the Constitution. It has been used in the past. It must be used now unless the decision as regards an agreement for limitation of armaments is to be made in a "sort of a way," as Lincoln characterized the decision in the Dred Scott case; i. e., by a bare majority of a divided government, and they not quite agreeing with one another in the reasons for making it; so made that its avowed supporters disagree with one another about its meaning, and plainly based upon a mistake of facts—that the power to enter such an agreement is distinctly and expressly affirmed in the Constitution under the power to make treaties delegated to the President and the Senate.

The People of the United States do not want the decision on the limitation of armaments made in a "sort of way."

There exist many and substantial reasons why any agreement for the limitation of armaments should be submitted for the action of the People of all Member Nations.

Ratification by the People of all its member nations would eliminate the primary defect which existed in the League of Friendship under the Articles of Confederation of the Thirteen States.

Such a ratification would substitute the coercion of the magistrate which applies to men, for the coercion of force, which must be applied to bodies politic. The coercion of force, of any kind,

against a body politic is an unfriendly act and is the cause of ALL wars.

There exist no reasons why the validity of any action by the United States should be questioned.

Submission to the People of the United States will remove all doubt.

Any other action denies the principle on which our Constitution is erected: That Governments have powers only as they are delegated by the People.

It is maintained that: 1. The treaty-making powers delegated under the Constitution to the President and Senate are a definitely limited power; 2. All treaties which concern matters for which legislative power is expressly and distinctly granted to Congress must be approved by Congress; 3. Agreements and compacts with foreign Powers must receive the consent of Congress; 4. All cases in law and equity arising under treaties made shall be judged by the Supreme Court; 5. The power to enter into Alliances and Confederations is expressly and distinctly reserved to "We, the People of the United States."

As if to emphasize and justify the limits imposed upon the treaty-making powers granted by "We, the People" to the President and Senate under our Constitution, the following is quoted from Washington's letters, edited by Jared Sparks:

A copy of Washington's Farewell Address printed in Claypoole's *American Daily Advertiser* of 19 September, 1796, has endorsed the following words in Washington's handwriting, which were designed as an instruction to the copyist, who recorded the Address in the letter book.

"The letter contained in this gazette addressed 'To the People of the United States' is to be recorded, and in the order of its date. Let it have a blank page before and after it, so as to stand distinct. Let it be written with a letter larger and fuller than the common recording hand. And where words are printed with capital letters, it is to be done so in recording and those other words, that are printed in italics, must be scored underneath and straight by a ruler."

Washington's Farewell Address consisted of about 5,800 words. The words emphasized in that address as per the marginal instructions to the copyist were as follows:

North, South, East, West, secure, outlets, one nation, Geographical, Northern, Southern, Atlantic, Western, desert, constantly and political.

All with the exception of constantly and political were specially marked to emphasize the principle of unity into one nation and one country. The following quotations from the farewell address show how constantly and political were used as underlined.

"Against the insidious wiles of foreign influence I CONJURE YOU TO BELIEVE ME, FELLOW CITIZENS, the jealousy of a free people ought to be *constantly* awake; since history and experience prove, that foreign influence is one of the most baneful foes of Republican Government.

"The great rule of conduct for use, in regard to foreign nations, is, in extending our commercial relations; to have as little *political* connection as possible. So far as we have already formed engagements, let them be fulfilled with perfect good faith. Here let us stop."

## DISCUSSION

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### Officers for Shore Duty Only

(SEE PAGE 1865, WHOLE No. 226)

MAYOR GENERAL C. C. WILLIAMS, U. S. ARMY—In the December issue of the U. S. NAVAL INSTITUTE PROCEEDINGS appears an article under the subject "Officers for Shore Duty Only," and I feel it incumbent on me to call attention to certain statements which are so in error that I am confident the author will desire to correct them, especially as they reflect unjustly on a service of which in the nature of things he must have not more than a casual knowledge.

To be specific, on page 1889 this statement is made:

That the Ordnance Corps designed and built the guns and mounts with practically no attention to suggestion from artillerists of long experience; provided slow and antiquated methods of loading and handling the mechanism long after the navy and foreign gun builders had brought their guns up to date, and as a crowning achievement accomplished the feat of so redesigning the French 75, which had stood the test of four years of war, as to prevent the arrival of a single battery of American built 75's at the front before the Armistice.

The reference is here to the Ordnance Corps or Department of the Army.

The latter part of this statement is so contrary to actual fact that it comes as a distinct shock to those officers who yet have a vivid recollection of the struggle with manufacturers who urged time and again that the French 75 be made under Americanized drawings with many modifications. To insure interchangeability with the same type of material made abroad, authoritative instructions were sent from the A. E. F. and enforced by the War Department that the French drawings and even materials of construction be adhered to with the utmost closeness.

Any departures which exist are entirely trivial, do not effect interchangeability and were in every case based entirely upon the request of the manufacturer and upon his demonstration that production would otherwise be delayed. As a matter of fact, we will never know whether production would not have been faster if the procedure condemned by the author had actually been followed, and certainly those who did make the material would have preferred this procedure.

With regard to the first sentence of the quotation, it should be appreciated that ninety per cent of the guns and carriages now installed in our seacoast fortifications have been in service twenty years or more, and that most of this armament is of models 1890 to 1896. This armament is

still serviceable within the limitations as to caliber and range, and all of these carriages permit a high rate of fire of two or more shots per minute. It is quite evident that this armament should not be compared with more modern seacoast or naval armament. However, it is rather remarkable to note that the rate of fire, which in the final analysis gives a true measure of the method of loading and maneuvering, still compares very favorably with that of the most modern seacoast or naval armament.

## Are Corps Needed in the Navy

### *Amalgamation and Specialists Versus Corps*

(SEE PAGE 1209. WHOLE NO. 222)

CAPTAIN ELLIOT SNOW, (CC) U. S. N.—The article contributed by Commander J. O. Fisher, U. S. Navy, to the August NAVAL INSTITUTE PROCEEDINGS<sup>1</sup> states in several places that the navy needs no corps and further has as a complete background the idea of amalgamation; the arguments he offers in support of these statements are far from being convincing, except perhaps to himself alone.

The lack of conviction on my part arises from the fact that the subject matter is presented in such an obscure manner as to lead me to think that his own thoughts on the subject are quite hazy, and because the arguments he alleges to be those of the Staff Corps are very far from those advanced by many in those corps.

Although the thoughts contained in the article are often not sufficiently clearly expressed to permit of complete detailed analysis, this does not constitute a valid reason why the entire article should be allowed to pass without comment. Comment by one who holds a contrary view should be placed on record in the NAVAL INSTITUTE PROCEEDINGS because the views expressed in this article and those which appeared in the December PROCEEDINGS<sup>2</sup> if allowed to gain ground, will contribute their weight, however small that may be, toward a most undesirable condition—the lessening of the control of the Secretary of the Navy over the navy. What other form of control may grow up as a result of such a condition remains to be seen. To assist in avoiding even one step being taken in the direction of creating a sentiment in the service in favor of amalgamating the Construction Corps and the Line is the object of these comments.

There are good reasons for the existence of Corps in the navy and these groups of officers, instead of subtracting from the central authority, the Secretary of the Navy, add much strength to that office. This presupposes efficient administration by the Bureaus on the one hand and on the other that the corps are wisely controlled. In short, efficient and loyal corps that honestly endeavor to promote the interests of the navy by dis-

<sup>1</sup>Amalgamation and Specialist versus Corps, by Commander J. O. Fisher, U. S. N.—NAVAL INSTITUTE PROCEEDINGS.

<sup>2</sup>Officers for Shore Duty Only, by Captain E. P. Jessop, U. S. N.—U. S. NAVAL INSTITUTE PROCEEDINGS, Vol. 47, Whole No. 226.



interestedly supporting each other in their particular lines of work. I wonder if the author really believes that those who advocate corps in the navy are actuated by the sordid motive of a lust for power at the expense of the good of the service.

The comments which follow will be better understood by those who take the trouble to read them if the meanings of a few words are now defined. These are "operate," "control," "activity," "function," and "executive."

To operate means to work.

To control means to exercise restraining or governing influence over.

An activity, as used by the author, evidently means a kind of work.

A function is a kind of work—an activity—appropriate to any office, business or profession.

The adjective "executive" is usually coupled with the word "authority" and means power to enforce.

The reader of these comments should also bear in mind the following statements of the author concerning the composition of the navy.

"13. The navy consists of (1) the fleet and (2) the shore establishment; and,

"14. A fleet is divided into battleship, cruiser, destroyer, submarine, mine and air forces and the train."

Clearly these various forces and the train are composed not only of ships but as well of the personnel attached to those ships. The "shore establishment" is therefore by implication the entire personnel and material of the navy not included in the fleet.

An inquiry into the statements made by the author regarding corps organization, is now in order. In the article he defines a corps as being:

"an organization of individuals under the law centering in a Bureau and controlling special activities in the shore establishments for which the Bureaus' appropriation may be expended."

Under this definition, Line officers are a corps of the navy. As a matter of fact, they are the Operating Corps of the Navy,—but they, however, perform other functions as well in two material bureaus.

They are an organization of individuals which, under the law, centers in more than one bureau (though this is not their sole work) and which controls special activities in the shore establishment for which bureau appropriations may be expended.

Notwithstanding his own definition and its logical inclusion of the Line the author states<sup>3</sup> that the navy needs no corps as a corps. Either his definition is wrong or his statement is at fault.

Again the author states:

"We need no corps, or other organization of individuals in the navy to substract, from central authority."

All persons in the service and out of it should heartily agree with this, but whilst so agreeing should ever remember that the central authority in

<sup>3</sup> Page 1218, par. 43, lines 9 and 10.

the navy does not reside in a corps of the navy: it resides in the Secretary of the Navy. All corps of the navy, the Operating Corps and all other corps should work under the central control of the Secretary of the Navy. This is necessary to insure that the navy will at all times perform its full mission. To successfully accomplish this, the defense of the United States, all corps should admit and recognize the function performed by the Line and so correlate their work as to strengthen its performance. This can be done by giving the Operating Corps the best possible tools with which to do its work. A reciprocal duty rests on that corps to admit and recognize the need for the existence of other corps and to correlate its work with theirs. Wisdom dictates that the house be not divided against itself. The navy, like the body, is not one member but many. Can the head say to the arm, "I have no need of you," or if the hands shall say, "Off with the head," shall it be! Those members of the body which *seem* to be more feeble, are necessary.

Inasmuch as the Line is a corps of the navy, the Supply Corps another, the Aeronautical Corps another, and the Medical Corps another, is it a fact that the fleet contains no corps<sup>4</sup> and that no corps exercises a restraining or governing influence over any kind of work in the fleet?<sup>5</sup> Clearly, the personnel of the fleet must be paid, clothed, fed and receive medical attention and the vessels of the fleet must be built and kept in condition.

Are there no kinds of work in the navy which are not duplicated in the fleet?<sup>6</sup> Does the fleet make chain, rope, clothing, powder, build ships, dock them, operate a wind tunnel or a model basin? All these and many more kinds of work are done in the navy that are not duplicated in the fleet.

Let us now examine whether or not the views expressed in the article about specialists are equally at variance with logic or facts. A specialist is defined thus:

"A specialist is an officer with special training, knowledge and experience in one of the many activities of the navy."

How then is it possible that mere assignment to duty can make an officer a specialist?<sup>7</sup> An assignment to duty simply affords an officer the opportunity to become a specialist, but he obviously can not become one unless he continues the work long enough to acquire the requisite knowledge, training and experience.

Officers (and men) with special knowledge, experience and training of all kinds are needed in the navy and always will be needed<sup>8</sup> and there are good reasons why specialists should be developed and their services utilized

<sup>4</sup> Page 1215, line 4.

<sup>5</sup> Page 1214, last line with definitions inserted.

<sup>6</sup> Page 1215, line 5.

<sup>7</sup> Page 1217, lines 8, 9, 10.

<sup>8</sup> Page 1219, par. 49, lines 1 and 2.

in the fleet and at the shore establishments.<sup>9</sup> Can it therefore reasonably be affirmed that it is of little importance what happens to specialists?<sup>10</sup>

Corps—and this term does not exclude the Line—as they actually exist in the navy but not as defined in the article, are simply groups of officers, most of whom are specialists in several lines of work. Their special training, knowledge and experience in the service have been acquired along allied lines of generally similar work. Ultimately this makes them expert in the performance of well recognized functions. These are of a military, sanitary, industrial, engineering, aeronautical, financial or other nature as imposed by modern conditions of human endeavor. Too minute subdivisions are not required in the service.

The individuals in any one of these corps could, within the limits of their natural intellectual endowments, have become equally as efficient officers in any other corps. In a number of cases I have no doubt personal predilections have not been realized until it has been too late to correctly choose the corps most suitable to their innate capabilities. Corps assignments should be made on a basis that would permit reassignments in the lower ranks.

In the article amalgamation is defined:

“as being an organization in which junior officers are given training and experience along the broadest and most comprehensive lines of activity in the navy, *with opportunities for special education and training as they show inclination therefor*, and where senior officers in the navy with a broad general experience occupy positions as commanding officers and as administrative officer<sup>11</sup> in the shore establishment all under a single control with undivided authority and responsibility for the efficiency of the navy.”

If I correctly interpret this definition of amalgamation, as to its effect on the Construction Corps, it means a complete coalescence of the Construction Corps and the Line; the complete uniting together into one body of a design and production corps, composed of a group of officers whose education and special training and experience are essentially along industrial lines which best fit them for shore establishment control and an operating corps whose education, special training and experience are essentially along military lines which best fit them for controlling the operations of the fleet. There are three grounds, two of which are closely related, upon which amalgamation may safely be advocated. First, it must be shown not by *à priori* argument, but from past experience, that the Construction Corps has failed to efficiently perform its work; second, it must be shown that it has so failed because its personnel is grouped into a corps. Third, it must be shown, without a reasonable doubt, that the personnel of the Operating Corps, if it disperses its attention over many

<sup>9</sup> Page 1211, par. 12, lines 1 and 2.

<sup>10</sup> Page 1219, par. 47, line 1.

<sup>11</sup> A slight change in the original text has been made in the three preceding words.

more subjects, will then be of *higher average ability*. Is it possible for the Line as a corps to give sufficient time to become proficient in the industrial problems of the control of civilian labor and the design and construction of vessels and their fittings and equipment, and do this without at the same time deducting and thus losing an equal amount of time that should be devoted to the line of work appropriate to their profession? I am unable to believe that the Line as a body, or even a large percentage of individuals in that corps, has any spare time to devote to such matters. The navy needs to be guided by experts and not by dilettantes.

A fair and impartial comparison of the types and numbers of our vessels today, as regards their design, construction and equipment, with those that have existed at each decade back to the days of the White Squadron in 1889 will show that the Construction Corps has not failed to keep pace with the needs of the operating personnel, nor has it ever retarded that pace.

Can it be shown that amalgamation will in the next forty or fifty years insure a greater material improvement in proportion to the money and effort expended in the design, construction, and equipment of our naval vessels, than has been achieved in the last third of a century by the Construction Corps?

Since the first and second reasons for amalgamation can be shown not to exist and as the third looks to be most doubtful of proof without experiment, will the service consent to another experiment such as the amalgamation of the Engineer Corps with the Line? The effect of this is now being manifested; the reason this was not felt sooner can be very simply explained. In all enduring organizations as large as that of the navy, a momentum exists due to the length of life of individuals that form a part of it and to the fact that established systems of procedure and precedent which exist continue to be followed irrespective of the type of organization under which they were developed. This momentum continues to be felt for about thirty years after a change of organization is made. The remarks I have once before made on this subject are equally pertinent here.

"There are many seagoing officers who consider the present engineering conditions as distinctly susceptible of improvement. It occurs to me to ask, assuming present engineering conditions and the existence of a separate Engineer Corps as in 1899, would there not be a much better chance of improvement if constructive criticism and insistent demands for improvement were made by the operating officers?"<sup>12</sup>

What is the present condition of our ships as regards engineering? Have they been improved by reason of the extinction of the Engineer Corps? Has the average ability of the Line officers been raised by that amalgamation? The study of the past is the one safe guide in forecasting the future.

<sup>12</sup> Comments on "Officers for Shore Duty Only" which appeared in the February, 1922, issue of the PROCEEDINGS.

Are corps needed in the navy? I hold that they are, but they should exist without making any distinctions as to relative or absolute rank. In a navy without this distinction, the assignment of younger officers to sea and shore duty in various corps would be possible without endangering their future prospects for the attainment of rank and the performance of highly distinctive service. When they arrive at an age when their natural inclinations or predilections for service are known they can safely and wisely be permanently assigned to that corps in which they will become experts and be of the greatest value to the service.

Instead of abolishing any more corps, rather let the service frankly discuss the alternatives of re-establishing an Engineer Corps, of creating an Ordnance Corps, of retaining the Aeronautical Corps, and of increasing the Construction Corps, so that more members of that corps may be available for tours of duty at sea. *In doing so, absolute instead of relative rank should be given to all, but at the same time the command afloat and the control in operations should rest with the Operating Corps.*

The arguments for corps in the navy are not the flimsy ones advanced and so frequently reiterated by Commander Fisher; they are not based upon a belief that officers could not have attained equal skill in other corps; still less are they bred by a sordid lust for power. The real arguments for corps are these: First, an unshakeable belief that amalgamation will surely stifle honest constructive criticism in the service; second, that amalgamation will pave the way to an industrial breakdown in the service in time of war; third, without corps the effective control of the navy—the fleet and the shore establishments—by its real head, the Secretary of the Navy, will be rendered well-nigh impossible.



## U. S. NAVAL INSTITUTE

### SECRETARY'S NOTES

#### Prize Essay Contest

After carefully considering the articles published in the Institute during the year 1921, the Board of Control, finding none of sufficient merit to warrant winning the prize, awarded Honorable Mention to the three

following:

"A Study of Our Navy Personnel Situation," Captain J. K. Taussig, U. S. Navy.

"Naval Aviation and a United Air Service," Captain T. T. Craven, U. S. Navy.

"Leadership," Captain R. D. White, U. S. Navy.

Life, regular and associate, 4856.

**Membership** New members, 18. Resignations, 132.

Deaths, 5:

Lieut. H. M. Ingraham, U. S. Navy.

Lieut. W. M. Derby, Jr., U. S. N. R. F.

Lieut. H. H. Morse, U. S. N. R. F.

Lieut. S. A. Forter, U. S. N. R. F.

Mr. George B. Beale.

Practically the whole service receives the benefit of the PROCEEDINGS, yet many officers who read it monthly are not members, and therefore contribute nothing to the support of the Institute.

Members are requested to urge non-members to join. Publication costs are now so high that the Institute is carrying a loss. The cost, per member, however, decreases with an increase in membership.

**Dues** The annual dues (\$3.00) for the year 1922 are now payable.

Regular and associate members of the U. S. Naval Institute are subject to the payment of the annual dues until the date of the receipt of their resignation.

**Discussions** Discussion of articles published in the PROCEEDINGS is cordially invited. Discussions accepted for publication are paid at one-half the rate for original articles, or about \$2.25 a page.

**Address of Members** To insure the delivery of the PROCEEDINGS and other communications from the U. S. Naval Institute, it is essential that members and subscribers notify the secretary and treasurer of every change of address, without delay.

**Book Department** *The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid.* The trouble saved the purchaser through having one source of supply for all books should be considered. The cost will not be greater and sometimes less than when obtained from dealers.

*The Boat Book, 1920, and The Landing Force and Small Arms Instructions, 1920, are now ready for issue. The price of the former is \$.50 and the latter \$1.00 per copy.*

**Index to Proceedings** The attention of readers of the PROCEEDINGS is invited to the classified analytical index for numbers 101 to 200 inclusive, which is noticed under "Publications." This is a most complete index, which has been prepared at considerable expense in order to make readily available the information contained in both the articles and the notes of these issues. Only a limited number of copies have been printed. Price, bound in cloth, \$2.35; bound in paper, \$1.85.

**Articles** The Institute desires articles of interest to all branches of the service, including the reserve force. Attention is invited to the fact that the submission of articles is not limited to members, and that authors receive due compensation for articles accepted for publication.

All articles and discussions submitted by persons belonging to the navy for publication in the PROCEEDINGS must be in duplicate, one copy being signed by the author, which will be submitted to



the navy department when the original is published, as required by General Order No. 46, of May 20, 1921.

**Reprints of Articles** The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the secretary and treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

**Illustrations** Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

Original photographs of objects and events which may be of interest to our readers are also desired, and members who have opportunities to obtain such photographs are requested to secure them for the Institute.

**Notice** Whole Nos. 6, 7, 10, 13, 14, 15, 17, 144, 173 and 194 of the PROCEEDINGS are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 75 cents per copy.

ANNAPOLIS, MD., February, 1922.

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BALANCE SHEET  
FOR THE YEAR ENDING DECEMBER 31, 1921  
U. S. NAVAL INSTITUTE

ASSETS

*Cash*

Farmers National Bank .....	\$ 4,499.71	
Savings Banks .....	16,541.74	\$ 21,041.45

*Accounts Receivable*

Dues .....	3,142.18	
Subscriptions .....	22.10	
Advertisements .....	717.13	
Various Dealers .....	17,373.94	21,255.35

*Other Assets*

Bonds .....	102,587.39	
Inventory .....	34,686.33	
Prepaid Royalty .....	291.29	
Furniture and Fixtures .....	\$2,915.66	
Less Depreciation .....	291.56	2,624.10
Prepaid Expense .....	1,154.36	
Authors Rights .....	2,964.41	
Refunds .....	2.70	144,310.58

TOTAL ASSETS.....		<u>\$186,607.38</u>
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LIABILITIES AND NET WORTH

*Accounts Payable*

Lord Baltimore Press .....	\$4,369.98	
Various Dealers .....	326.55	
Accrued Royalty .....	86.48	\$ 4,783.01

*Prepayments*

Dues .....	963.40	
Subscriptions .....	1,076.55	
Sundry .....	88.07	2,128.02

TOTAL LIABILITIES .....		\$ 6,911.03
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*Reserves*

Reserve Fund, December 31, 1920...	\$ 8,684.09
From Profits .....	160.00
Transferred from Surplus .....	120.00
	<u>8,964.09</u>

Reserve Bad Debts .....	\$ 560.27	
Charged Off .....	5.76	554.51
	<hr/>	
<i>Surplus</i>		
December 31, 1920 .....	162,720.86	
Transferred to Reserve Fund .....	120.00	
	<hr/>	
	162,600.86	
From Profits .....	7,576.89	170,177.75
	<hr/>	
NET WORTH .....		179,696.35
		<hr/>
TOTAL LIABILITIES AND NET WORTH .....		<u>\$186,607.38</u>

PROFIT AND LOSS STATEMENT  
FOR THE YEAR ENDING DECEMBER 31, 1921  
U. S. NAVAL INSTITUTE

TRADING

*Institute Publications*

Sales .....	\$56,454.89	
Income Advertisements .....	230.00	
	<hr/>	
Total Income Institute Publications .....		\$56,684.89
Purchases .....	\$28,145.12	
Add Inventory, Jan. 1, 1921 .....	30,206.65	
	<hr/>	
	58,351.77	
Deduct Inventory, Dec. 31, 1921 .....	32,609.62	
	<hr/>	
Printing Cost of Sales ....	25,742.15	
Add Royalty .....	5,084.23	
	<hr/>	
Total Cost of Sales .....		30,826.38
	<hr/>	
Trading Profit .....		\$25,858.51

*Purchased Books*

Sales .....	5,611.59	
Purchases .....	4,647.83	
Inventory, Jan. 1, 1921 ....	230.00	
	<hr/>	
	4,877.83	
Inventory, Dec. 31, 1921 ....	946.01	
	<hr/>	
Cost of Sales .....	3,931.82	
	<hr/>	
Profit on Sales .....		1,679.77
		<hr/>
		\$27,538.28

*Proceedings and Index*

Sales .....	712.71	
Income Dues & Subscriptions .....	18,129.46	
Advertisements .....	3,554.80	

Binding .....	64.00	
Life Fees .....	160.00	21,908.26

Total Income .....		22,620.97
Purchases .....	27,823.83	

*Deduct*

Inventory, Dec. 31, 1921 ...	1,130.70	
------------------------------	----------	--

	26,693.13	
Envelopes .....	771.45	
Discount .....	52.22	
Members (Dropped and Resigned) .....	2,339.61	
Contributors .....	4,630.68	
Prize Essay Awards .....	426.50	34,913.59

Loss on PROCEEDINGS .....		12,292.62
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Trading Gain .....		15,245.66
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## OPERATING EXPENSE

Postage .....	1,668.44	
Advertisements .....	776.56	
Office Expense .....	1,394.67	
Salaries .....	12,380.50	
Express & Hauling .....	458.29	
Board Meetings .....	1,353.92	
Insurance .....	14.40	
Gratuities .....	91.00	
Depreciation .....	291.56	
Cost Collection .....	3.75	18,433.09

Operating Loss .....		\$ 3,187.43
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## SUNDRY INCOME AND EXPENSE

Interest .....	5,904.44	
Less Interest Paid .....	345.97	5,775.62

Profit on Bond Sale .....	765.00	
Less Loss on Bond Sale ....	345.97	419.03

Appreciation Bond Value .....	4,677.50	
Sundries .....	52.17	10,924.32

Profit for Year .....		\$ 7,736.89
Profit Transferred to Reserve Fund .....	\$ 160.00	
Profit Transferred to Surplus .....	7,576.89	<u>7,736.89</u>

CHANGES IN NET WORTH  
FOR THE YEAR ENDING DECEMBER 31, 1921  
U. S. NAVAL INSTITUTE

## ASSETS

	<i>Dec. 31, 1920</i>	<i>Dec. 31, 1921</i>	<i>Increase</i>	<i>Decrease</i>
Cash Farmers National Bank...	\$26,990.84	\$ 4,499.71	\$.....	\$22,491.13
Cash Savings Banks .....	20,203.24	16,541.74	.....	3,661.50
Dues Receivable .....	4,929.99	3,142.18	.....	1,787.81
Advertisements Receivable .....	313.78	717.13	403.35	.....
Subscriptions Receivable .....	36.97	22.10	.....	14.87
Accounts Receivable .....	6,895.80	17,373.94	10,478.14	.....
Bonds .....	97,640.62	102,587.39	4,946.77	.....
Inventory of Books .....	30,436.65	34,686.33	4,249.68	.....
Prepaid Royalty .....	108.23	291.29	183.06	.....
Furniture & Fixtures .....	1,841.70	2,915.66	1,073.96	.....
Prepaid Expense .....	917.64	1,154.36	236.72	.....
Refunds Receivable .....		2.70	2.70	.....
Authors Rights .....		2,964.41	2,964.41	.....
Totals .....			<u>\$24,538.79</u>	<u>\$27,955.31</u>

## LIABILITIES

			<i>Decrease</i>	<i>Increase</i>
Depreciation Furniture & Fix- tures .....	\$.....	\$ 291.56	\$.....	\$ 291.56
Accounts Payable Lord Balti- more Press .....	14,844.83	4,369.98	10,474.85	.....
Accounts Payable Miscellaneous	448.11	326.55	121.56	.....
Royalty Payable .....	431.92	86.48	345.44	.....
Prepaid Dues .....	1,289.04	963.40	325.64	.....
Prepaid Subscriptions .....	1,176.61	1,076.55	100.06	.....
Prepaid Advertisements .....	75.00	.....	75.00	.....
Miscellaneous Overpayments ...	84.73	88.07	.....	3.34
Reserve for Bad Debts .....	560.27	554.51	5.76	.....
Totals .....			<u>\$11,448.31</u>	<u>\$ 294.90</u>
Year's Profit .....			35,987.10	28,250.21
			<u>\$35,987.10</u>	<u>\$35,987.10</u>

Audited and Found Correct

JOHN DOWNES, *Commander, U. S. Navy.*  
J. O. RICHARDSON, *Commander, U. S. Navy.*  
H. D. COOKE, *Commander, U. S. Navy.*  
Auditing Committee

Approved by the Board of Control, February 15, 1922.

F. M. ROBINSON, *Lieutenant Commander, U. S. Navy,*  
*Secretary and Treasurer.*



# PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT R. A. HALL, U. S. Navy

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## FRANCE

WORK ON FRENCH WARSHIPS.—Although the French naval programme was adopted last April, it is not believed that work has been begun on any of the ships which were voted. The programme of new construction embraces six cruisers, twelve large and twelve medium destroyers and thirty-six submarines, and authorises the conversion of the uncompleted battleship *Béarn* into an aircraft carrier. Building operations will probably commence at an early date, for on December 9 the Chamber voted the sum of 160 million francs for disbursement on new construction during 1922. The six cruisers have been re-designed on a larger scale. They will displace 8000 tons and have a speed of 35 knots, while the armament will consist of a new mark of 7.6-in. gun, of very high velocity. A complete armour belt and strong deck protection will be fitted. These will be the first light cruisers to be built for the French navy for well over twenty years. The twelve large destroyers will be of 2400 tons displacement, and the twelve medium boats of 1400 tons. The displacement of the thirty-six submarines is expected to average 1000 tons. A large amount of reconstruction work was done during the past year, the vessels so treated including three battleships and the five ex-German light cruisers surrendered to France under the Peace Treaty. The destroyer *Enseigne Gabolde*, laid down in 1913 but on which work was suspended during the war, was launched on April 22.—*The Engineer*, 13 January, 1922.

FRENCH DOCKYARDS.—The Minister of Marine has introduced a bill in the Chamber for the reorganization of the naval dockyards, of which only two, Brest and Toulon, are to be kept up under present conditions.—*Naval and Military Record*, 4 January, 1922.

FRENCH GOVERNMENT AND AERIAL BUDGET.—Last week the votes for the Air Budget were passed by the French Chamber, the chief items being: subsidies, 46,389,000 frs.; aerodromes, 36,690,000 frs.; reserve training, 3,345,000 frs.; specific work and expenses, 86,405,000 frs. Curiously the Chamber of Deputies so far has not renewed the credits for the Air Attachés in London, Washington, Rome and Peking.—*Aerial Age Weekly*, 16 January, 1922.

FRENCH NAVY IN 1921.—The war has demonstrated that the quality of naval weapons was of higher moment than either their number or size, and, therefore, that continuous improvement on scientific lines was the safest and most economical means of attaining that superior efficiency that counts for more than apparent strength. A long series of realistic experiments (in the *Tempête*, *Terrible*, *Fulminant*, *Tonnerre*, *Neptune*, *Hoche*, *Jéna*, etc.) gave France her "*obus alourdi*," the best projectile in existence, whilst lack of experiments with torpedoes caused France to enter the war with inferior submarine weapons. No wonder, with these facts in mind, Minister Guist'hau decided to widen the scope of the comprehensive experiments projected by his predecessors. If financial difficulties stood in the way of France regaining the ground lost during the war, an effort at least should be made to restore old Gaul to that position of technical supremacy which she has oft occupied in the course of her long naval history, that started seven centuries before any mention was made of either an American or of a Japanese fleet.

The eight-week experiments in the ex-Boche battleship *Thüringen*, that had several times to be patched up and refloated, had, of course, for object the testing of the practical solutions which French artillerists have given to the several new ballistic problems revealed by the war, viz., the penetration and smashing power of ordinary heavy shells striking thin and thick armour under wide angles of incidence, the defensive value of super-imposed decks, the best protection for ammunition bunkers (a study of the *Coronel* and *Jutland* mysteries), the comparative worth of new 13-4-inch shells at all angles, without mentioning the experimenting with various chemical shells and with the new devices to render night firing effective at long range. The results are said to have been most gratifying and to have confirmed Paris experts in the belief that they are working in the right groove, and notably that the new 18-inch guns, shortly to be tested at Gâvres, represent an advance over all comers. The Paris "*Yacht*" predicted some time since the fitting of six of these powerful monsters in battleships of just over 30,000 tons, and it is possible that plans have already been prepared to that effect by the Section Technique. The Washington comedy, that will bind France just in the measure in which the solemnly-signed Versailles Treaty has bound America, is not so much an obstacle to the construction of such battleships as is the actual popular reaction against the much-slandered mastodon. But the construction of these super-calibre guns is to be continued, their 50,000 metres effective range and the power of their 3,600-lb. shells suiting them for more than defensive duties, in co-operation with submarines and sea-planes, and being likely to persuade any hostile armour-clad to give a wide berth to Gallic coasts.

The question of super-cannon is also known to have been studied by Gallic artillerists, although no tangible results have come to light, which justifies to a certain extent the complaint of pessimistic critics that Boche-land is still retaining the supremacy of range with her Berthas and improved Berthas, the secret of which may not have been so fully found out as has been asserted in some quarters. Indeed, it will not pay to sneer at these "baby-killing weapons," advantage of range being a capital



asset. As a matter of fact, it is the knowledge that they possessed such an advantage that caused the Germans to make war both in 1870 and in 1914.—*Naval and Military Record*, 18 January, 1922.

### GERMANY

GERMAN WARSHIP BUILDING IN 1921.—The keel of a new light cruiser for the German navy was laid at Wilhelmshaven. The vessel is to be of 5600 tons displacement, and is designed for a speed of 30 knots. The armament will be eight 5.9-in. guns and four torpedo tubes.—*The Engineer*, 13 January, 1922.

GERMANY IS CONVERTING HER WARSHIPS INTO FREIGHTERS.—The question as to whether it is feasible to convert warships into merchant vessels has been answered in a practical manner in Germany, where cruisers have been successfully made into freighters. In the United States expert opinion has been divided on the subject, the consensus being, however, that while it is impossible to convert capital ships, cruisers might be reconstructed so as to make them suitable for service in the merchant marine.

Under the terms of the Versailles Treaty Germany was confronted with the necessity of finding some method of disposing of her war tonnage, and shipbuilders and naval architects immediately sought for ways and means of utilizing these ships for commercial purposes rather than to relegate them to the scrap heap. A practical solution was ultimately found, with the result that several of these cruisers were placed in German shipyards and rebuilt into freighters which are now doing good service in such capacity.

With her wide experience in dismantling and breaking up discarded warships, combined with low labor costs, Germany has become the logical center in Europe for the scrapping of warships. England, Russia and France are negotiating with German yards to break up old warships, and reports state that thus far the British have contracted for the destruction in Germany of six obsolete battleships, eight cruisers and twelve destroyers. Britain expects this tonnage to yield a clear profit to them of forty shillings per ton over the expenses of taking the ships to German ports and the cost of destruction. On ships broken up in England the Admiralty loses money, the price of scrap metal being inadequate to cover labor costs. Ten obsolete warships owned by the Soviet Russian Government have been sold at a profit to German firms for destruction.

Germany is eager for this work on account of the high prices prevailing in that country for scrap metal.—*Nautical Gazette*, 7 January, 1922.

GERMAN SHIPBUILDING INDUSTRY.—Economic conditions in Germany during the past year, so far as the shipping and shipbuilding industries are concerned, have differed from those pertaining in every other country throughout the world. The freight crisis has had considerable influence on German shipping interests, but the situation has been more favourable for the development of the mercantile marine than in other countries, as the costs of running vessels have been less than in the case of ships under other flags owing to the depreciation of German money value. Shipowners in Germany, therefore, have been able to spend some money on new tonnage.

The mainstay of German shipbuilding, however, has been the Indemnity Law. During the war, and for some time afterwards, the Government agreed to compensate shipowners for all their losses resulting from the war. Unfortunately, this arrangement could not be continued when shipbuilding costs rose higher and higher, and at the

beginning of 1921 an arrangement was arrived at by which a compromise was made in regard to all the claims of the shipowners. This settlement was a great disappointment to shipping and shipbuilding interests, as the sum destined for the reconstruction of the German mercantile marine was restricted to 12 milliards of marks. Under the new arrangement shipowners were called upon to build up a merchant fleet with a total deadweight-carrying capacity of 2,500,000 tons, which is only about one-third of the tonnage owned in Germany in 1914. Another condition was that a considerable percentage of the cost of building should be borne by the shipping companies. The work of construction was to be spread over five years; and as about five milliards of the total of 12 milliards of marks had already been spent at the beginning of 1921, only the balance of some seven milliards was available for expenditure during the period named. Even this arrangement only received the sanction of the Reichstag in view of the fact that the sum voted would provide work, and thus stem the tide of unemployment. As shipbuilding costs continued to rise steadily, it soon became apparent that a considerable restriction of output was inevitable.

The facts mentioned above have naturally influenced the total volume of tonnage launched from German shipyards during the past year, which may be estimated at about 330,000—350,000 gross register tons. No official reports have been issued up to the time of writing. A small portion of the indemnity granted by the Government, viz., 10 per cent., was made available for purchasing tonnage from other countries. This condition has been taken advantage of, and moreover German shipowners have used some of their own funds for the same purpose, especially in repurchasing their old ships from the Allies.—*The Shipbuilder*, January, 1922.

GERMANY IS DISARMED.—Whether Germany has accomplished "moral" disarmament or not, there can be no question that she has carried out to completion the material disarmament demanded at the Armistice and at Versailles to completion. If today she were morally war-minded, and if she were not disarmed, the threat of war would still be present. But Germany, so far as any military operations is concerned, is so completely bereft of armament, that any military man, basing his statements upon the facts as they are and as they are known to be, will tell you that, for all her seven million men of fighting age, she is not only incapable, today, of military operations, but of necessity must remain so for a long period to come.

Modern war is an engineer's job. It is a matter of mechanical appliances produced on an enormous scale and wielded by a highly trained army of mechanics. Destroy the mechanism of war and you have destroyed the possibility of war so far as a disarmed people is concerned.

Thanks to the Conference at Washington, we have laid the bugaboo of Japanese navalism. It remains for the Conference, or a similar one, to lay the bugaboo of an ever-present German militarism. The question is: Has Germany disarmed, or has she not?

The answer to that question is to be found in a review of the work of the Interallied Commission on Military Control, with headquarters at Berlin, which was printed in a recent issue of the *New York Times*, in which it is stated that both in respect to munitions of war and of establishments devoted to their manufacture, Germany today is from ninety to ninety-five per cent disarmed. Field and heavy artillery is too bulky for successful concealment; and we have noted that occasional official reports during the past half year have stated that all of the German war material of this character is accounted for. Of the celebrated *minen-*

*werfers*, 11,579 have been surrendered, 11,489 have been destroyed, and 90 remain. Machine guns and rifles are, of course, easier of concealment; yet the surrender and destruction of these have been on an enormous scale, including 86,505 machine guns surrendered and 84,108 destroyed, with 2397 remaining. Of rifles and other small arms, 4,460,649 have been surrendered, 4,351,627 destroyed, and 109,021 remain. We are informed that this military disarmament has extended to field bakeries, field ambulances, field printing plants, armored trains, pontoons and bridging material, that it covers, in fact, everything conceivable to the military mind.

Not only has Germany surrendered or destroyed her finished military material; but of the 7000 manufacturing plants and factories which were known to have been engaged wholly or in part in manufacturing war materials, 5000, commencing with the great Krupp plant, have been demilitarized; and of the 2000 factories remaining, the majority are small and of very limited capacity. The Interallied Commission on Military Control has done this work of industrial disarmament so thoroughly that, in its opinion, fully two years would elapse before Germany could begin to supply munitions of war, even on a limited scale.

Shortly after the Armistice, we wrote in this paper that the very last thing the German people were thinking about was another war. We repeat that statement today, with a conviction which has been strengthened by the sweeping manner in which her disarmament has been carried through.—*Scientific American*, February, 1922.

**SUBMARINES WHICH GOT HOME.**—The difficulty which was experienced in the war in compiling accurate and reliable statistics of the anti-submarine results is recalled by the publication in the *Marine-Rundschau*, the German naval monthly review, of a series of personal narratives dealing with actions at sea. In one of these, reference is made to the British claim that *UC 79* was destroyed on Oct. 19, 1917. According to Oberleutnant Fritz Otto Busch, the boat was going for more than five months afterwards. "*UC 79*," he says, "set on 20.3.18, and did not return. Her former commander set out in *UB 58* on 9.3.18 and not return." *UC 79* was the vessel which was understood to have been destroyed by submarine *E 45*, Lieutenant-Commander G. R. S. Watkins, in the North Sea. Sir Henry Newbolt, in his book, *Submarine and Anti-Submarine*, relates how the German was caught red-handed in the task of destroying a Dutch steamer by means of gunfire. Commander Watkins fired his first shot at 400 yards and missed; altering course instantly, he fired again in three minutes, when a loud explosion was heard, and on coming to the surface again there was no trace of the "U" boat. If Lieutenant Busch is right, the boat must have managed to crawl home in a damaged condition. The results of submarine combats, as Mr. Balfour once said, varied from practical assurance down to faint possibility, and when even this one, a practical certainty, turns out otherwise it will be seen how difficult was the task of gauging precisely the effect of the anti-submarine war.—*Army, Navy and Air Force Gazette*, 7 January, 1922.

## GREAT BRITAIN

**FUTURE NAVAL CONSTRUCTION.**—If there is one thing more than another which must have impressed itself upon the minds of naval officers in regard to the progress of the Washington Conference, it is that decisions have been arrived at and promulgated, not by the experts, but by the politicians. They have been reached, that is to say, less in accordance with actual or prospective needs than with the political exigencies of the moment. It is therefore well that there should be a survey of the present

state of naval construction from a professional standpoint. Such a survey is contained in an excellent paper by Sir George Thurston, of Messrs. Vickers, in the new *Cassier's Marine Number*. Sir George deals with the influence on naval construction, and the lessons, of the war, during which, he says, financial restrictions being largely removed, progress consisted principally in pressing home well-known principles to the extreme limits of scientific practicability. His paper, read in conjunction with those which Sir Eustace d'Eyncourt gave at the Institution of Naval Architects, brings out afresh what a wonderful achievement was that of our shipbuilders and marine engineers.

As a designer of capital ships, Sir George writes on this phase of his subject with an authority which is somewhat rare in recent discussions. Citing the Falklands—where the overwhelming superiority of the "Invincibles" over Von Spee practically annihilated the latter's squadron without loss to themselves—as "an excellent example of utilizing technical advantages to the maximum extent," he says that a vessel of the *Courageous* type (practically unarmoured) would have achieved precisely the same results; but to conclude hastily that this action justifies the omission of armour and protection in all future designs "would be to lose sight of the question of degree of visibility, which completely modifies the relative values of protection and primary guns." The uncertainty of this element, too vital to be ignored, necessarily exercises a very important influence on the distribution of the available weight between the two primary factors of heavy armament and speed in a design. It is also a reminder to us that ships would get out of date, even in a naval holiday, by changing political conditions altering the venue in which they would most likely require to be used. A vessel the tactical qualities of which were determined with a view to North Sea fighting would be unsuited for action across the long distances of the Atlantic or Pacific.

From many other points with which Sir George Thurston deals in his article, a selection may be made of his conclusion that there are no reasonable prospects of the introduction of a submersible battleship to replace the existing capital ship. How heavily the increased speed which submarines would need to keep up with surface units has to be paid for in other directions may be seen from his table comparing the particulars of the "K" class, of 24 knots, with the "Scott" class of destroyer, of 36 knots, and with a proposed 30-knot submersible. In the submersible, the speed, with 50,000 instead of 40,000 horse-power, is six knots less than in the *Scott*, and yet the latter has five 4.7 in. guns to the submarine's one 5.5 in. The oil fuel capacity is about equal, but the dimensions of the under-water boat are 50 per cent. greater, and the displacement over 200 per cent. more—5,450 tons, as compared with 1,800. These illuminating figures show clearly how the quality of submergence can only be obtained by very heavy sacrifice in each of the other factors which determine an efficient surface fighting unit. The absolutely necessary increase in size is always accompanied by an appreciable fall in under-water speed. The final conclusion of Sir George is as follows:—

The termination of the world war marked the beginning of a new era in naval construction, and with respect to the future, in the comparatively short period necessary for reconstruction, the battle fleets of the world will, in certain respects, present a marked contrast to the fleets which took part in recent engagements, and contain important units and appliances as yet in embryo.—*Army, Navy and Air Force Gazette*, 14 January, 1922.

**SMALLER SHIPS.**—*Sir*: It is most sincerely to be hoped that the present opportunity of reducing the tonnage of fighting ships will not be missed.

It will never occur again. An acceptance of the possibility of placing a definite tonnage limit upon the largest class of ship, hitherto deemed impossible to impose, has been reached. The Powers have agreed that no ship of the future shall exceed 35,000 tons. This is of the highest value.

But why 35,000 tons? What is there in this number that is of importance? Why not 35,000, or 30,000, or 20,000, or 10,000? There is in reality no reason whatever for that figure. A fleet of battleships of 30,000 tons, opposed to another of the same tonnage, can produce no greater results than one of 10,000 tons against another of 10,000 tons. All you have is a bigger battleship. Not only are there no greater results, but the probability is that the results of an action between these immense, costly, irreplaceable ships will be smaller than those of lesser ships. Officers will be less inclined to risk them; and we shall get the same position as that of the army of the Potomac, of which Sheridan said that "the trouble was that the commanders never went out to lick anybody, but always thought first of keeping from getting licked." Was there not, indeed, something of this kind in the minds of the commanders at Jutland?

There is neither strategical nor tactical necessity for ships of this prodigious size. They are no more capable of performing the functions for which "battleships" are intended than would be vessels of, say, 10,000 tons. They cannot keep the sea any longer. They may be faster; but as the enemy's ship is likewise faster, there is nothing gained—they have no advantage over an equal enemy. The only reason they have been built has been that other people have built them, or that one desires to get an advantage over someone else by building a bigger and more powerful instrument. So we have progressed from the battleship of the nineties—a 14,000-ton ship—to the 42,000-ton *Hood*, and still we have only got a battleship, nothing more. The only difference is that we pay 10 millions for each unit instead of one. The growth in size of the ship has not increased the strength at sea of any Power. Science, so far from giving up more for our money, as it does in most activities of this world, gives us less. A ship that can do no more costs at least ten times as much.

But can this new type of ship do not only no more, but as much as her smaller predecessor? She has not greater powers of remaining at sea. She is not able to use the harbours that her predecessor could. She requires more supplies. She needs, just as much as they, an escort to protect her if she goes to sea. She cannot operate in some parts of the world because there are neither bases capable of taking her, nor docks. It is the same for all Powers concerned. We have all got bigger ships, but not one of us is one whit stronger than if we had never increased the size at all, since all have got them.

Now we have a chance of putting a stop to this foolish waste. Instead of putting the limit at 30,000, put it at, say, 10,000. That is sufficient to provide a ship that can go anywhere; and if no one is allowed to build a bigger, the need that forced competitors forward disappears. It has not been possible to do this before because of the impossibility of getting an agreement to limit size. Today all the Powers are eager to reduce expenditure, and here we have the easiest means in the world. What science will then do will be to make these 10,000 tons of metal go as far as possible in producing an instrument capable of performing the duties that have called it into existence.

For this a ten-years' holiday is essential. The old mastodons must not be replaced annually. Let them die out. The fear that armour-plate firms or others will suffer is a case of putting the cart before the horse.

Navies do not exist to keep armour-plate firms in existence; the reverse is the case. Moreover, by diminishing the size of the ship the call for armour-plates is sensibly diminished. The reduction in scale of the ship will also be a deterrent to anyone who is in a hurry to build; for, as she will be weaker than the present ship, no one will wish hastily to replace his present ships by smaller ones. The old ships will, therefore, be made to last as long as possible, all of which is a definite saving to the taxpayer, accompanied by no loss whatever in security.

No country would venture to go outside the limit of 10,000 any more than it will venture to exceed the 35,000 tons. How each navy utilized its disposable tons would be decided by its views as to strategy and tactics.

These are important points. There appear to be people who imagine that there is some military reason why a "battleship" should carry 16-in. guns, a mass of armour, and so forth. There is none. These guns and this armour have been introduced in the struggle to produce something more powerful than what is possessed by an enemy or possible enemy. This is not a military, but a mechanical, reason. Now that our statesmen are sitting round a table and discussing this in friendly fashion, eager to reduce the cost of defence, they have such an opportunity as has never occurred before. They have the people behind them. The sole qualifications of a ship of war are that she shall be able to go to sea and to fight. There is a limit in size below which she cannot do these things; there is also a limit beyond which it is quite unnecessary for her to go. I have suggested 10,000 tons, but this is guesswork—it may be 6,000 or 14,000. I am sure it is not more.

I am yours faithfully,

ADMIRAL.—*London Times*, 23 November, 1921.

**FUTURE OF THE SUBMARINE.**—The insistence by France on a submarine tonnage of 90,000 has apparently dissipated the hope that it might be possible, failing a policy of absolute prohibition, to limit the tonnage of submarines to be constructed by the naval Powers. Great Britain, as well as other nations, will be left with a free hand, and the new form of competition in naval armaments, although less costly than that in capital ship construction, may be as acute as any previous phase of warship building. It is probable, too, that the proportions of auxiliary craft to be assigned to the different nations may also prove a source of disagreement, and that no actual achievement will stand to the credit of the Washington Conference but the limitations of the numbers and tonnage of the big ship. It is possible that agreement even on this question may have been partly due to a belief that Sir Percy Scott's midshipman's estimate of the value of the big warship may be true in ten years' time. British policy appears to be quite clear. Our essential requirement is to keep the seas open to our merchant fleet, and if no agreement is reached with regard to submarines, it will be necessary for us to concentrate on the production of the most efficient submarine fleet and also on measures designed to protect our merchant fleet from submarine attack. On that subject we know more than any other nation, and it is now common knowledge that had the war been prolonged the U boat would have been driven from the seas. Assuming that we have forewarning of what might happen in another war, we are not likely to be caught napping.—*The Engineer*, 30 December, 1921.

**BERMUDA TO ESQUIMALT.**—The new epoch in naval strategy as regards North American waters which was opened by the completion of the Panama Canal may now be said to have been consummated by the voyage

of the *Raleigh* to Esquimalt. In this, her first visit to Pacific ports, the new flagship of Vice-Admiral Pakenham's squadron has shown what an advantage it is to have the use of the new waterway. In 1914 the Atlantic and Pacific coasts of Canada were completely divided as regards naval protection. Now one squadron is able to cover the interests of both sea-boards. In 1914 we had to maintain on this side the cruiser squadron which was commanded by the gallant Sir Christopher Cradock, and on the Pacific coast, for station duties, the sloops *Algerine* and *Shearwater*. At the present time the residents of British Columbia can see for themselves, not a pair of small, obsolete craft, but a modern cruiser which, even though based on Bermuda, is within comparatively easy distance of them. Such vessels as the *Algerine* were quite useless for fighting purposes, and when war came had promptly to be paid off and their crews transferred to the *Niobe*. By doing away with the necessity of keeping such vessels in commission, the Panama Canal makes for economy as well as efficiency in our naval distribution. Its advantage to Canada is also shown by the fact that the cruiser *Aurora* and destroyers *Patriot* and *Patrician* can work together as one squadron, cruising from one side to the other as occasion requires, instead of having to be divided up like the *Niobe* and *Rainbow*, one in the Atlantic and the other in the Pacific.—*Army, Navy and Air Force Gazette*, 7 January, 1922.

**CALCUTTA'S CRUISE.**—For the cruise in the Pacific of the light-cruiser *Calcutta* (Capt. W. B. Compton), of the North American and West Indies Station, the following programme has been arranged, the vessel being due to return to Bermuda on May 14:—

Colon .....	Jan. 24
Panama .....	Jan. 25
San Pedro .....	Feb. 9
Honolulu .....	Feb. 21
Palmyra Islands .....	March 2
Washington Islands .....	March 3
Fanning Islands .....	March 4
Christmas Island .....	March 6
Honolulu .....	March 11
Hilo Hawaii .....	March 20
San Pedro .....	March 31
San Diego .....	April 1
Salina Cruz .....	April 11
San Jose .....	April 14
Libertad .....	April 19
Amapala .....	April 24
Corinto .....	April 26
Punta Arenas .....	May 2
Panama .....	May 8
Colon .....	May 8

—*Naval and Military Record*, 28 December, 1921.

**OLD WARSHIPS SOLD.**—Another large number of obsolete warships has been acquired for breaking-up purposes by a British firm, the Slough Trading Co., of London. The craft, to the number of thirty-one, are lying at the three principal naval ports, and consist of seven battleships, four cruisers, three light cruisers, three monitors, and other craft, including twelve destroyers. The vessels at Portsmouth are the battleships *Zealandia*, *Commonwealth*, and *Implacable*, the cruiser *Roxburgh*, the light cruisers *Fearless* and *Forth*, the monitors *Earl of Peterborough* and *Sir Thomas Picton*, and the patrol leader *Ithurial*.

The vessels at Devonport are the battleships *Bellerophon* and *Cæsar*, the cruiser *Essex*, the light cruiser *Liverpool*, and the patrol leader *Marksman*; and those at Chatham are the battleships *Lord Nelson* and *Hibernia*, the cruisers *Carnarvon* and *Theseus*, and the monitor *Sir John Moore*.—*Naval and Military Record*.

UTILIZATION OF DISCARDED CAPITAL SHIPS.—A writer in a London paper suggests that capital ships of the great Powers, which have to be discarded according to the agreement approved by the Disarmament Conference, should not be scrapped but used as oil bunkering hulls after having been gutted out and dismantled. This proposal is endorsed by *Syren and Shipping* which says that the idea should commend itself, not only to the Admiralty, who are erecting big naval oiling stations at different places throughout the Empire, but also to the great oil companies, and to shipowners generally.

As oil-hulks the battleships and battle-cruisers would be much more valuable than as scrap, especially as they could be converted into the merest of shells, and all the machinery and fittings recovered. If the plan were adopted many of them could be utilized within a comparatively short time, and they would thus be of great advantage to shipping, and so indirectly to shipbuilding.—*Nautical Gazette*, 7 January, 1922.

EXPLOSIONS IN EX-GERMAN CRUISER IN TORBAY.—A series of explosions took place in the ex-German cruiser *Heligoland*, at anchor in Torbay, while steam was being raised for weighing anchor for continuance of towage to Liverpool, where the cruiser will be broken up. The explosions occurred under the boiler and completely wrecked it, seriously damaging another close by.

It is rumoured that all the English coal had been used, and the remnant of the German fuel in the bunkers, in which, it is stated, there was some ammunition, was being used. Another report attributes the explosions to the presence of chemicals in the boilers.

The explosions severely injured the chief engineer, Ari Verhey, a Dutchman, who was detained in Brixham Cottage Hospital.—*Naval and Military Record*, 4 January, 1922.

FUTURE OF HAULBOWLINE DOCKYARD.—While other dockyards are clamoring for Government work, Haulbowline will, in consequence of the new condition of affairs in Ireland, be vacated by the Admiralty. The yard will be stripped of all its machinery and handed over to the new Irish Government, and its future rôle is a matter of speculation. The large number of apprentices who were undergoing their training at Haulbowline will be transferred to English and Scottish naval dockyards.—*The Engineer*, 13 January, 1922.

WARSHIP BREAKS FROM TUGS.—During the storm in the Channel the obsolete warship *Vengeance* broke adrift from the three tugs that were towing her from Plymouth to Dover. A gale from the southwest was raging on Tuesday, when the *Crusade*, the *Gauntlet*, and the *Vanquisher* left Plymouth with the *Vengeance*. At 10:30 the same night the *Vengeance* broke adrift from the *Vanquisher*, whilst two hours later the *Gauntlet* lost her tow. At 11:30 a. m. on Friday during a heavy gale the *Crusade* also parted company with the old warship, which was then forty miles southwest of Portland.

The Channel cargo steamer *London Queen* put in at Cherbourg early on Friday to ask for help to be sent to the *Vengeance*, which she had encountered on her way from London to Guernsey, nine miles northeast of La Hogue Cape light, drifting and abandoned by her tugs.



The *London Queen* passed a tow line to the *Vengeance*, but it broke.

The authorities at Cherbourg despatched tugs, and the vessel was towed into Cherbourg on Sunday.

The *Vengeance* was launched in 1899. She is a pre-Dreadnought battleship of 12,950 tons, belonging to the *Canopus* class. The *Goliath* and the *Ocean*, of the same class, were lost in the war.

The *Vengeance* served one commission in the Mediterranean and two on the China Station, and in 1905 was attached to the Devonport Reserve Division. In 1906 she was attached to the Channel Fleet, and was paid off at Devonport in 1908 and transferred to the Portsmouth Division of the Home Fleet. She was employed in connection with the Dardanelles operations during the war, and rendered useful service after the *Queen Elizabeth* brought her guns into action against Cape Helles.

After the Armistice she returned to Devonport, where she was subsequently placed on the sale list.—*Naval and Military Record*, 4 January, 1922.

A MINISTRY OF DEFENSE.—Unity of control in matters of national defence is not a novel idea. It has many times been mooted in this and other countries, and on at least two occasions has been put into practice abroad, with disastrous results. Although the German navy nominally remained an independent command throughout the war, it was actually controlled by the General Staff through the medium of the Kaiser as Supreme War Lord, and in the last resort its movements were directed by the military chiefs. In the same way the Russian navy was placed under military control at the outbreak of war, and its activities were always governed by the exigencies of the land campaign. This meant that the fleets in the Baltic and Black Sea were deprived of all initiative, and compelled to remain more or less passive on several occasions when a vigorous offensive would probably have changed the face of the whole war. But in spite of these discouraging examples a movement is now on foot here to group the navy, the army, and the air force under a Minister of Defence, and this, it is understood, being one of the leading proposals submitted by the Geddes Committee.

In our opinion the scheme is a bad one, however attractive it may seem to the lay mind. Of the many strong arguments which can be brought against it there is one that carries special weight—namely, the certainty that military influence would be supreme at the Ministry of Defence, and that soldiers would gradually come to dictate the principles of strategy by sea as well as on land. Such a system would sooner or later bring us to disaster. We have seen what has happened since the air force was annexed by the War Office. Service aviation has been developed mainly along army lines, and naval flying neglected. Representations to the Air Ministry have had no effect, for all the power there reposes in the hands of those who have a bias towards the land service. One of the crying needs of the moment is the setting up of an independent naval air service, but, instead of this, the country is now invited to reverse the traditional order of service seniority and place the navy under a department which would certainly be ruled by soldiers.—*Naval and Military Record*, 4 January, 1922.

## JAPAN

WARSHIP CONSTRUCTION IN 1921.—The effect of the Washington reduction scheme will be to render null and void the capital ship programme which passed the Imperial Diet in July, 1920, authorising the construction of four battleships and four battle-cruisers. Furthermore, the scheme necessitates the cancelling of four large vessels which are approaching completion, viz., the battleships *Kaga* and *Tosa*, 40,000 tons

each, and the battle-cruisers *Amagi* and *Akagi*, of about 41,000 tons each, together with the battle-cruisers *Atago* and *Takao*. The keel of the *Atago* was laid at Kobe on November 25, but three weeks later it was announced that further work on the ship had been abandoned *sine die*. The *Takao* will not now be commenced. In all, therefore, Japan is called upon to forfeit fourteen capital ships, including nine which had not been laid down. After a great deal of negotiation at Washington it was decided that she should retain the battleship *Mutsu*, a sister of the *Nagato*, the necessary adjustments being made in the tonnage ratios assigned to the British Empire and the United States. A full description of all the Japanese vessels named above was published in *The Engineer* of November 25 last. The *Kaga*, one of the condemned battleships, was begun at the Kawasaki yard, Kobe, in July, 1920, and launched on November 17 of last year. Her sister ship, *Tosa*, was laid down at Nagasaki in February, 1920, but up to the present her launch has not been reported. Both vessels are to be broken up. The battle-cruisers *Amagi* and *Akagi*, also condemned, are very near the launching stage at the Government yards of Yokosuka and Kure respectively, and will doubtless be put afloat in order to clear the slips. The light cruiser *Nagara*, 5570 tons, was launched at Sasebo on April 25. She is very similar in all respects to the *Kuma* class, being designed for a speed of 33 knots and an armament of seven 5.5-in. guns. Sister ships are the *Isudzu* and *Natori*. All these later light cruisers are understood to be oil burners. Those completed have made very successful trials, achieving their designed speed without difficulty. Their fuel capacity, and consequently their steaming radius, is somewhat greater than that of British vessels of equivalent size. It is not known whether any of the twelve light cruisers authorised in 1920 have been commenced. About twenty destroyers, including several first-class boats of 1500 tons, are in varying stages of construction. The only intelligence as to submarine progress is derived from Press reports of doubtful authority. In October last the Osaka journal *Mainichi* wrote:—"The construction of submarines for the Japanese navy is being steadily carried out. Recently three submarines, one at Sasebo and two at Yokosuka, were launched, and there are now nine others under construction at the Kure, the Yokosuka, and the Sasebo naval arsenals, and the Kawasaki private yard. These are all medium-size boats, of 800 to 900 tons." Reports from other sources indicate that several submersible cruisers, of 2000 tons or more, are building in Japan. In an interview published last November, the Vice-Naval Minister, Admiral Ide, said that the Navy Department was then fully occupied in working out problems arising from the sudden cessation of work, involving heavy liabilities on the part of the Government and making provision for idle workmen, a problem with which neither Great Britain nor America was faced in the same degree. Considering her industrial position, Japan, he said, could not cease naval work suddenly without causing widespread distress among hundreds of thousands of people dependent on the workers. He added, however, that as soon as Washington had reached an agreement the work on order would be stopped both in private and State yards without regard to consequences. The Japanese papers state that, as all the yards in the country are now mainly dependent on naval contracts to keep them employed, the enforcement of the "naval holiday" may administer the death-blow to the ship-building industry.—*The Engineer*, 13 January, 1922.

**LOSSES AND GAINS FROM FOUR-POWER PACT.**—As regards the British Empire, the effect of the agreement is to bring our quota of sea power to a level with that of the United States, thus realising the policy which the Government, with the approval of the Admiralty, formally adopted nearly

two years ago. For some years we shall continue to have a slight margin in capital tonnage and a large one in cruising ships, though this will be negative to some extent by the later design of the eight best U. S. battle-ships. In the Pacific Ocean the agreement will tend to place us at a disadvantage by inhibiting the creation of new bases which would be necessary for the maintenance of a great modern fleet. Japan ought not to be dissatisfied with the results of the Conference. Not only has it relieved her of the necessity of going forward with a building programme which imposed a dangerous strain on her pecuniary resources, but it has actually brought her a substantial increment in relative strength. It leaves her in unchallenged control of the Western Pacific and absolutely guarantees her policy in China against interference. She no longer has to fear the establishment of great American fleet bases within reach of her coasts.

These advantages are so important and obvious that it is surprising to learn that the Naval Agreement is violently criticised by a section of the Japanese people. At a meeting held in Tokyo on November 27, at which a number of prominent politicians, journalists, and professors were present, a resolution was passed deprecating the system of naval ratios and demanding a common standard of power for all navies. One speaker declared that Admiral Baron Kato, the principal Japanese delegate, ought never to be allowed to land at Yokohama if he failed in enforcing his seventy per cent proposal, while another urged that if this proposal was rejected every effort should be made to prevent the Privy Council from ratifying the arrangement which excluded it. A little reflection will no doubt convince these people that their chief delegate, so far from deserving opprobrium, merits the gratitude of his country for having guarded Japanese interests so successfully.—*Naval and Military Record*, 18 January, 1922.

REVIEW OF JAPANESE SHIPBUILDING.—As the year closes there are in operation in Japan fourteen shipbuilding yards capable of constructing ocean-going merchant ships, as compared with a total of fifty-three in 1918. Of these fourteen yards, only nine are actually engaged in the building of ocean-going tonnage, and in many cases progress on the vessels in hand has been slowed down almost to the vanishing point, in order to keep the organizations together as long as possible, or because the vessels themselves are not required on account of the general shipping depression. A considerable proportion of the new naval construction, however, has been given out to the private yards, largely to give employment to the workers; while some of these establishments have turned their attention to structural engineering, locomotive and tramcar building, or to the manufacture of motor cars, aeroplanes, etc.

Omitting small craft, the estimated output of merchant tonnage for the year under review is forty vessels of 190,000 gross tons. This compares with a pre-war output of from 30,000 to 40,000 gross tons from the four shipyards then capable of turning out vessels of over 1,000 tons. It

TABLE I.—MERCHANT SHIPS CONSTRUCTED

Year	No. of Ships	Gross Tons
1914.....	16	78,010
1915.....	8	40,485
1916.....	40	141,827*
1917.....	89	348,430
1918.....	189	518,788
1919.....	136	621,513
1920.....	93	433,265
1921.....	40	190,000*

\*Estimated.

will be seen, therefore, in spite of the relatively depressed conditions, that the tonnage constructed is about six times the normal pre-war output. Table 1 shows the rise and fall in the output of new mercantile shipping from 1914 to the end of 1921.—*The Shipbuilder*, January, 1922.

**JAPANESE COMPETITION FELT.**—Japanese competition in the Chinese coasting trade is extremely serious, and is likely to become more so unless the cost, of operating British vessels can be reduced. Even taking into consideration the recent increase in Japanese wages, says the *Shipping World*, the salaries paid to man a Japanese vessel of, say, 2,000 tons is little more than half what it costs a British vessel of the same tonnage. For some time the Chinese boycott of Japanese vessels favored the employment of British tonnage on this coast, but now the boycott appears to have died a natural death, and the Chinese are prepared to employ the cheapest tonnage available.—*Nautical Gazette*, 16 January 1922.

### UNITED STATES

**THREATENED REDUCTION IN NAVY PERSONNEL.**—That the House naval committee contemplates some action at this session looking to a reduction in the personnel strength of the navy, both commissioned and enlisted, was confirmed this week when Chairman Butler of that committee authorized the statement that a reduction would be recommended by his committee and inviting suggestions from service sources as to the best method of bringing about a scientific reduction and indicating that in the absence of such helpful suggestions the naval committee would proceed to bring about a reduction in personnel strength in its own way. This cut will apply to all branches of the naval service, including, of course, the regiment of midshipmen; but how the reduction will be brought about and how deeply the incision will be made can only be conjectured. This contemplated action of Mr. Butler's committee is readily recognized as being a much more businesslike move than the gesture of Senator King last week in introducing his joint resolution summarily calling for the immediate reduction of the army to 75,000 and the navy to 50,000, for it presages a change in the present general law which fixes the commissioned strength of the navy upon a percentage basis upon an authorized enlisted strength of 140,000 men. The appropriations committee of the House could further reduce the number of enlisted men allowed the navy for next fiscal year in the same simple manner it adopted in the last navy act by appropriating for a less number; but the authorized officer strength of the navy will remain as it is until the statute has been changed, and which change can be made, under the rules of the House, only at the instance of the House navy committee. It is interesting to note, however, as stated in this paper last week, that upon making the computations of the commissioned strength on January 1, after the redistribution and the reductions caused by the reversion of temporary officers, it was ascertained that there were 4,071 line officers remaining, or practically the legal allowance of four per cent based upon the present enlisted strength, whereas the legally authorized strength of the navy would permit of the retention of 5,499 commissioned line officers. Whether or not the chairman of the naval committee will be successful in eliciting from naval sources any suggestions that would aid in a downward revision of the navy personnel is at least doubtful; but his candor in announcing his intentions is commendable.—*Army and Navy Register*, 14 January, 1922.

NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR,  
WASHINGTON, D. C.

January 10, 1922

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—Progress as of Dec. 31, 1921

Type Number and Name	Contractor	Percent of Completion <sup>a</sup>			
		Jan. 1, 1922 on Total Ship		Dec. 1, 1921 on Total Ship	
BATTLESHIPS (BB)					
45 <i>Colorado</i> .....	New York S. B. Cpn.....	86.	84.9	84.9	83.8
47 <i>Washington</i> .....	New York S. B. Cpn.....	69.8	63.6	69.8	63.6
48 <i>West Virginia</i> .....	Newport News S. B. & D. D. Co.	70.	65.4	65.7	59.3
49 <i>South Dakota</i> .....	New York Navy Yard.....	38.	31.1	36.5	29.5
50 <i>Indiana</i> .....	New York Navy Yard.....	34.3	26.8	33.9	26.3
51 <i>Montana</i> .....	Mare Island Nvy. Yd.....	27.6	19.	27.6	19.
52 <i>North Carolina</i> .....	Norfolk Navy Yard.....	36.7	27.1	36.7	27.1
53 <i>Iowa</i> .....	Newport News S. B. & D. D. Co.	31.2	26.5	30.7	25.8
54 <i>Massachusetts</i> .....	Beth. S. B. Cpn. (Fore River).....	11.	4.3	11.	4.3
BATTLE CRUISERS (CC)					
1 <i>Lexington</i> .....	Beth. S. B. Cpn. (Fore River).....	31.1	21.4	28.8	19.3
2 <i>Constellation</i> .....	Newport News S. B. & D. D. Co.	20.	17.6	17.1	15.
3 <i>Saratoga</i> .....	New York S. B. Cpn.....	32.4	25.4	31.	23.6
4 <i>Ranger</i> .....	Newport News S. B. & D. D. Co.	3.8	1.4	3.5	1.3
5 <i>Constitution</i> .....	Philadelphia Nvy. Yd.....	12.8	7.8	12.3	7.3
6 <i>United States</i> .....	Philadelphia Nvy. Yd.....	11.8	6.8	11.5	6.5
SCOUT CRUISERS [LIGHT CRUISERS (CL)]					
4 <i>Omaha</i> .....	Todd D. D. & Const. Cpn.....	99.	93.	98.4	91.7
5 <i>Milwaukee</i> .....	Todd D. D. & Const. Cpn.....	93.6	86.2	93.6	86.
6 <i>Cincinnati</i> .....	Todd D. D. & Const. Cpn.....	87.6	81.2	87.4	81.
7 <i>Raleigh</i> .....	Beth. S. B. Cpn. (Fore River).....	63.7	45.6	63.7	45.6
8 <i>Detroit</i> .....	Beth. S. B. Cpn. (Fore River).....	76.9	61.6	74.4	58.1
9 <i>Richmond</i> .....	Wm. Cramp & Sons Co.....	83.	77.	81.	73.
(a) 10 <i>Concord</i> .....	Wm. Cramp & Sons Co.....	79.	71.	74.	65.
11 <i>Trenton</i> .....	Wm. Cramp & Sons Co.....	55.	43.	53.	40.
12 <i>Marblehead</i> .....	Wm. Cramp & Sons Co.....	47.	33.	47.	33.
13 <i>Memphis</i> .....	Wm. Cramp & Sons Co.....	40.	26.	40.	26.
AUXILIARIES					
Repair Ship No. 1, <i>Medusa</i> (AR1).....	Puget Sd. Navy Yd.....	74.1	62.7	72.5	60.9
Dest. Tender No. 3, <i>Dobbin</i> (AD3).....	Phila. Nvy. Yd.....	66.9	66.6	66.6	66.3
Dest. Tender No. 4, <i>Whitney</i> (AD4).....	Boston Nvy. Yd.....	47.1	37.8	41.3	35.
Sub. Tender No. 3, <i>Holland</i> (AS3).....	Puget Sd. Nvy. Yd.....	21.5	5.5	21.5	5.5
Aircraft Tender <i>Wright</i> , (AZ1).....	Tietjen & Lang.....	Del. 12/16/21		99.3	.....
PATROL VESSELS					
Gunboat No. 22, <i>Tulsa</i> (PG22).....	Charleston Nvy. Yd.....	71.3	57.5	71.2	56.6
DESTROYERS					
338 <i>Wasmuth</i> .....	Mare Island Nvy. Yd.....	Comm. 12/16/21		99.9	99.9
339 <i>Treser</i> .....	Mare Island Nvy. Yd.....	98.8	98.8	98.	98.
340 <i>Perry</i> .....	Mare Island Nvy. Yd.....	86.	85.7	82.7	82.2
341 <i>Decatur</i> .....	Mare Island Nvy. Yd.....	82.1	81.8	79.5	79.

(a) Light Cruiser No. 10 *Concord*—Launched 12/15/21

There are four fleet submarines and thirty-seven submarines under construction.

There are five fleet submarines and one submarine authorized but not under construction or contract.

**CAPITAL SHIP STRENGTH AS DETERMINED BY THE ARMAMENTS CONFERENCE**  
 Displacement—Efficiency in Last Column Estimated on 20-Year Life  
 Assigned by Conference

UNITED STATES							
CAPITAL SHIPS	Heavy Guns	Broadside Energy Foot-Tons	Date Completed	Displace- ment in Tons	Years Old, Nov. 11, 1921	Fraction of 20-Year Life Remaining	Displace- ment-Effi- ciency as Reduced by Age
Maryland.....	Eight 16"	792,000	1921	32,600	0	20/20	32,600
Colorado.....	Eight 16"	792,000	1921	32,600	0	20/20	32,600
Washington.....	Eight 16"	792,000	1921	32,600	0	20/20	32,600
California.....	Twelve 14"	914,160	1921	32,300	0	20/20	32,300
Tennessee.....	Twelve 14"	914,160	1920	32,300	1	19/20	30,685
Idaho.....	Twelve 14"	914,160	1919	32,000	2	9/10	28,800
Mississippi.....	Twelve 14"	914,160	1917	32,000	4	4/5	25,600
New Mexico.....	Twelve 14"	914,160	1918	32,000	3	17/20	27,200
Arizona.....	Twelve 14"	787,272	1916	31,400	5	3/4	23,550
Pennsylvania.....	Twelve 14"	787,272	1916	31,400	5	3/4	23,550
Oklahoma.....	Ten 14"	656,060	1916	27,500	5	3/4	20,625
Nevada.....	Ten 14"	656,060	1916	27,500	5	3/4	20,625
Texas.....	Ten 14"	656,060	1914	27,000	7	13/20	17,550
New York.....	Ten 14"	656,060	1914	27,000	7	13/20	17,550
Arkansas.....	Twelve 12"	629,746	1912	26,000	9	11/20	14,300
Wyoming.....	Twelve 12"	629,746	1912	26,000	9	11/20	14,300
Utah.....	Ten 12"	490,000	1911	21,825	10	1/2	10,912
Florida.....	Ten 12"	490,000	1911	21,825	10	1/2	10,912
Totals.....	192	13,385,176		525,850			416,259
GREAT BRITAIN							
Hood (modified).....	Eight 16"	817,280	.....	37,000	0	20/20	37,000
Hood (modified).....	Eight 16"	817,280	.....	37,000	0	20/20	37,000
Royal Sovereign.....	Eight 15"	658,400	1916	26,600	5	3/4	19,950
Royal Oak.....	Eight 15"	658,400	1916	26,600	5	3/4	19,950
Resolution.....	Eight 15"	658,400	1916	26,600	5	3/4	19,950
Revenge.....	Eight 15"	658,400	1916	26,600	5	3/4	19,950
Ramiliés.....	Eight 15"	658,400	1917	26,600	4	3/4	21,280
Queen Elizabeth.....	Eight 15"	658,400	1915	28,925	6	7/10	20,247
Warspite.....	Eight 15"	658,400	1915	28,925	6	7/10	20,247
Barham.....	Eight 15"	658,400	1915	28,925	6	7/10	20,247
Valiant.....	Eight 15"	658,400	1916	28,925	5	3/4	21,694
Malaya.....	Eight 15"	658,400	1916	28,925	5	3/4	21,694
Benbow.....	Ten 13.4"	606,000	1914	25,850	7	13/20	16,803
Empress of India.....	Ten 13.5"	606,000	1914	25,850	7	13/20	16,803
Iron Duke.....	Ten 13.5"	606,000	1914	25,850	7	13/20	16,803
Marlborough.....	Ten 13.5"	606,000	1914	25,850	7	13/20	16,803
Hood.....	Eight 15"	658,400	1920	43,000	1	19/20	40,850
Renown.....	Six 15"	493,800	1916	27,550	5	3/4	20,663
Repulse.....	Six 15"	493,800	1916	27,550	5	3/4	20,663
Tiger.....	Eight 13.5"	484,800	1914	29,600	7	13/20	19,240
Totals.....	164	12,773,360		582,725			447,837
JAPAN							
Nagato.....	Eight 16"	745,840	1921	35,000	0	20/20	35,000
Mutsu.....	Eight 16"	745,840	1921	35,000	0	20/20	35,000
Hiyuga.....	Twelve 14"	789,600	1918	32,750	3	17/20	27,837
Ise.....	Twelve 14"	789,600	1917	32,750	4	3/4	26,200
Yamashiro.....	Twelve 14"	789,600	1917	32,000	4	3/4	25,600
Fuso.....	Twelve 14"	789,600	1915	32,000	6	7/10	22,400
Kirishima.....	Eight 14"	526,400	1915	28,450	6	7/10	19,915
Haruna.....	Eight 14"	526,400	1915	28,450	6	7/10	19,915
Hiyei.....	Eight 14"	526,400	1914	28,450	7	13/20	18,493
Kongo.....	Eight 14"	526,400	1913	28,450	8	3/4	17,070
Totals.....	96	6,755,680		313,300			247,430

—Scientific American, February, 1922.

**CUTTING OUR NAVY RATIO.**—"Men fight, not ships," said the late Admiral Lord Fisher, the greatest naval man of his day. If the reminder was needed in England, it is needed much more in the United States. The British have been compelled to think of their navy and to keep it efficient as a matter of vital importance to their safety. But Americans have given little thought for a generation to naval or marine affairs, convinced that war was a misfortune with which we need not seriously concern ourselves. Civilian fallacies as to defense therefore have much more influence in this country than in England, and one of these is that which Lord Fisher corrects in the maxim quoted. We have a disposition to think that we can invent mechanical devices to win wars. We assume that if we build a certain number of battleships we have a naval defense. We think ships fight. We do not stop to realize that ships do not fight, but, as the old naval phrase goes, "are fought." John Paul Jones' ship did not fight, Jones fought his ship. Perry, Decatur, Farragut, Dewey, fought their ships.

"Of course," says the American civilian when it is put that way, "of course I know a ship must be fought by men." But while he says this a congressman rises and proposes to cut our naval personnel so that our ships lack the men to fight them.

We have just entered into an agreement to hold our ships to a certain ratio. But Congressman Kelly of Michigan proposes such a reduction of naval personnel that this ratio is reduced from 5 to 2, measured by actual efficiency and the maxim that "men fight, not ships."

Congress should realize that the limitation of the British and Japanese navies make it certain that both these powers will see that their minimum is a highly efficient force. What is saved by the junking of old ships and the cessation of costly new building will be turned so far as is necessary to making their fleets 100 per cent efficient. If we, on the other hand, proceed to cut our naval personnel so that the ships we are permitted are undermanned and some of them laid up for lack of crews, we have altered the ratio of our naval power by our own act and to our own serious disadvantage. Our delegation has procured the acceptance of a ratio of strength represented by 5-5-3. But if our fleet is deprived of sufficient men our strength will no longer be represented by 5, but by some lesser figure. Captain Knox estimates that Congressman Kelley's proposed cut would reduce it to 2, or less than Japan.

This of course would be to overrule the well considered plan adopted by the Conference and defeat the attempt to secure our safety from attack. It is not economy to destroy our insurance.—*Chicago Tribune*, 20 December, 1921.

**JUNKING ALL THE SHIPS.**—The Navy Department announces that shortage of funds will prevent the projected joint maneuvers of the Atlantic and Pacific fleets which were to have been held in Panama Bay in February. There is not enough money for fuel. The fleet is divided in violation of correct navy principles, and it cannot be reunited, even for maneuvers, because it cannot buy enough coal and oil.

The attitude of Congress towards the navy is disquieting. The Administration agrees with Japan and Great Britain to junk part of it, but Congress wants to shoot the works and junk all of it, to decrease the personnel, make it impossible to man the ships and keep them in commission, and consequently make effective fighting of them impossible.

By such procedure Congress can reduce the American navy below the Japanese in spite of the higher ratio allowed by the Washington Conference. The limitation of tonnage means more than ever that the fighting power is in the men. Japan and Great Britain, having sound policies, will

know that competition has been eliminated from construction, but increased in training.

Both will take measures to increase the fighting power of the ship by increasing the skill of the officers and men. We shall be in luck if Congress does not insist upon the reverse of this and decrease the fighting power by depriving the navy of sufficient men and by making their proper training impossible because of lack of funds.

Then the United States, even with more ships, will have a fleet inferior to Japan's. That was Japan's relation to Russia and it cost Russia the war. Japan defeated the larger Russian navy because her ships had the better trained men and could fight better.—*Chicago Tribune*, 28 December, 1921.

THE PROPER MANNING OF OUR FLEET.—The so-called Hughes plan for the limitation of armaments provides in the case of the United States for the scrapping of ships not yet completed on which no officers and men are now serving. It also includes the junking of many of the older battleships which are now tied up, out of commission with no officers and men on board. In a similar manner and to a less extent, it applies to the other navies concerned.

It must be understood, therefore, that it does not actually reduce the numbers or strength of the ships of the active fleets now in commission belonging to the several nations party to the proposed agreement. New construction is to be stopped, and thereby money will be saved in the future. Old ships, out of commission, are to be sold, and thereby a present saving is to be accomplished.

It is becoming clear that the foreign navies, limited in new construction, intend to maintain their present active fleets at the highest possible point of efficiency with adequate and contented personnel. The Russo-Japanese war as well as the recent world war brought home one lesson very clearly, namely, that ships inadequately manned by poorly trained men are but a wasted effort. Today, as in former years, it is the quality of the personnel and not the ships themselves that decide victory or defeat for a nation.

The danger faces the United States that its people, misunderstanding the results of the Limitation of Armaments Conference, will lend themselves to the dismantling and crippling of their present active fleet which the agreements of the Conference authorize them to retain.

It must also be borne in mind that it takes time to commission a ship and get her up to the point of operating efficiently where she can take her place with success in the battle line. To mold and train the fleet into war harmony and team work takes long training and experience. To dissipate the efforts of the last few years in fleet development and war readiness is a matter of very serious moment to the country. It involves such a throwing away of costly effort in the training of officers and men and in material preparation, that a pause should be made to consider the consequences and the price to be paid before it is permitted.

There appears to be a tendency in Congress not only to accept what the Limitation of Armaments Conference proposes but to go much further and reduce the personnel that is required to properly man the ships which the conference plan authorizes the United States to retain. If this should be done it would mean that instead of a naval ratio of 5-5-3 being maintained between the United States, Great Britain, and Japan, the United States by its own act would lower its position in that ratio by cutting the strength of its present naval personnel—a personnel which already is not sufficient to man fully the fleet permitted to the United States, under the provisions of the Conference.



These facts should be brought home to the country for with them go sea power and the initiative in guiding world affairs. Unless a nation is strong and ready, her good intentions and ideals for the betterment of the world are of but small avail. With these facts are also bound up the questions of preparedness and national insurance against war.

**THE MANNING OF OUR SHIPS.**—The Limitation of Armaments Conference in its agreements permits the United States to retain a fleet greater than that now in active commission. The ships now in commission are short of officers and men; but in spite of this there are a number of gentlemen in Congress who propose to still further reduce the effectiveness of the fleet by heavy reductions in the personnel.

The country should be aroused to the danger of this, for with it accomplished our navy would fall well below the ratio of relative strength outlined in the provisions of the Limitations of Armaments Conference. Are we to hand over the sea power of the Pacific to another nation?

In comparing the personnel strength of the various navies, too frequently the error is made of examining the forces concerned on purely a numerical basis. The character and experience of the personnel should be studied before a true estimate of relative strengths can be attained.

In this connection, investigation will show that the navy of the United States is largely manned by young men in their first enlistment. In fact on June 30, 1921, there were approximately 98,000 men who were serving in the navy with no previous service, and with less than four (4) years' experience. When it is understood that on the same date the total strength of the navy was about 119,000 it is readily seen what a high percentage of new men were in the process of being trained for naval service.

On the same date there were approximately 8,000 men in the navy with four (4) and less than eight (8) years' service, and about 5,000 with eight (8) and less than twelve (12) years.

Examining the strength of the British navy for July, 1921, it is seen that out of a total strength of about 103,656 men, about 68,000 were serving in a continuous service period of twelve (12) years and 21,000 were in the ten (10) year enlistment period following the first twelve (12) year enlistment. But 8,000 were in the short service period of five (5) years.

The Japanese navy is organized very much on the same lines as the British. Both these services have reserves of seasoned officers and men in their merchant marine.

The United States navy with its short periods of enlistment and heavy yearly turnover in recruits and discharges is at a disadvantage in its effort to maintain the same relative plane of efficiency and war readiness.

During the fiscal year ending June 30, 1921, there were about 54,000 first enlistments and 16,000 reenlistments, while the discharges amounted to about 57,000, and the desertions to about 10,000.

It is clear from the above that in order for the United States to hold its fleets on the same relative numerical strength as say that of Great Britain, setting aside the question of the degree of experience, our navy should maintain a personnel approximately fifteen per cent greater in order to allow for the boys in training barracks and schools of instruction ashore.

This also brings home the fact that due to the high percentage of new men constantly in our service the need of experienced officers to train and supervise ship operations is of necessity higher in our navy than in the other two services that have been under consideration, where the men are more seasoned and of longer sea service.

Instead of this being the case it will be found upon investigation that but about 600 out of the total officer line strength of our navy on Janu-

ary 1, 1922, can, from length of service, be considered experienced officers; and that the ratios of officers to men in the British and Japanese navies is higher than in our own.

The above are some of the points that must be clearly understood in meeting the effort to reduce the strength of our present navy personnel.

**JANUARY SHIPBUILDING OUTPUT IN DETAIL.**—The Bureau of Navigation, Department of Commerce, reports 69 sailing, steam, gas and unrigged vessels of 46,108 gross tons built in the United States and officially numbered during the month of December, 1921, as follows:

	Atlantic and Gulf		Pacific		Great Lakes		Western Rivers		Total	
	No.	Gross	No.	Gross	No.	Gross	No.	Gross	No.	Gross
<b>WOOD</b>										
Sailing .....	8	133	..	.....	..	.....	..	.....	8	133
Steam .....	..	.....	2	226	1	39	..	.....	3	265
Gas .....	26	438	10	320	2	19	4	108	42	885
Unrigged .....	2	877	3	499	..	.....	1	11	6	1,387
Total .....	36	1,448	15	1,045	3	58	5	119	59	2,670
<b>METAL</b>										
Sailing .....	..	.....	..	.....	..	.....	..	.....	..	.....
Steam .....	9	43,247	..	.....	..	.....	1	191	10	43,438
Gas .....	..	.....	..	.....	..	.....	..	.....	..	.....
Unrigged .....	..	.....	..	.....	..	.....	..	.....	..	.....
Total .....	9	43,247	..	.....	..	.....	1	191	10	43,438
<b>TOTALS</b>										
Sailing .....	8	133	..	.....	..	.....	..	.....	8	133
Steam .....	9	43,247	2	226	1	39	1	191	13	43,703
Gas .....	26	438	10	320	2	19	4	108	42	885
Unrigged .....	2	877	3	499	..	.....	1	11	6	1,387
Grand total .....	45	44,695	15	1,045	3	58	6	310	69	46,108

The above total includes 26 rigged vessels of 529 gross tons and 4 unrigged vessels of 1,108 gross tons, total 30 vessels of 1,637 gross tons built in years previous to 1921. Of the above total, 1 vessel of 14,187 gross tons was built for the United States Shipping Board. This was the passenger and cargo carrier *Lone Star State*. Other large vessels built during the month were the tankers *Byron D. Benson* and *New Jersey* of 8,211 and 6,740 gross tons respectively, the Munson Line steamer *Munargo* of 6,484 gross tons and the freighter *Steel Navigator* of 5,718 gross tons.

The following vessels which are not included in the above statement were built in this country for foreign owners during the month of December, 1921.

Rig.	Name of vessel	Gross	Owner	Flag
St.s.	<i>Cloverlock</i> (now <i>Canonier</i> )	3,285	Lloyd Royal Belge	Belgian
St.s.	<i>Osiris</i> (now <i>Bombardier</i> )	3,285	Lloyd Royal Belge	Belgian
St.s.	<i>San Teodoro</i>	5,874	Eagle Oil Transport Co.	British

—*Nautical Gazette*, 16 January, 1922.

**BIDS FOR RECONDITIONING THE LEVIATHAN.**—Bids for reconditioning the *Leviathan* have been opened and the offer of the Newport News Shipbuilding and Dry Dock Company to complete the work on the machinery and hull for \$6,110,000 was the lowest. John Wanamaker submitted a bid of \$587,303 for furnishing the hotel equipment of the vessel.

The bidders and the amount of their bids were as follows:

	General Specifications	Mach'y.
New York Harbor and Dry Dock Co. ....	\$10,130,400	\$766,714
Standard Shipbuilding Corporation.....	10,192,675	923,772
Morse Dry Dock & Repair Co. ....	8,497,000	692,200
Tietjen & Lang Dry Dock Co. ....	7,357,924	532,656
Newport News Shipbuilding & Dry Dock Co. ....	5,595,000	515,000
Warwick Machine Works, Newport News, Va. ....	10,350,616	629,931
James Shewan & Sons. ....	9,374,000	725,000

As a result of the unexpectedly low bids received by the Shipping Board, it is now probable that the giant ex-German liner will be refitted for service under the United States flag. The offer of the Newport News Shipbuilding and Dry Dock Company came as a gratifying surprise to the Board, their offer being fully \$1,000,000 less than anticipations. Officials of the Board and Fleet Corporation state that the bids were satisfactory, and that the Board will now attempt to raise the funds. It may be necessary to ask Congress for a special appropriation.—*Nautical Gazette*, 7 January, 1922.

AGAMEMNON AND MOUNT VERNON MAY BE REPAIRED.—As to the suggestion made recently that the *Mount Vernon* and the *Agamemnon* should be repaired and placed in service under the United States lines with the *George Washington* and the *America*, Joseph W. Powell, president of the Emergency Fleet Corporation, states that it is the intention of the Shipping Board to recondition these ships for the North Atlantic service, provided Congress grants the request of the Shipping Board for certain appropriations.

The reconditioning of the *Agamemnon* and *Mount Vernon* would not require a very large outlay. The Board is still undecided as to whether it should refit any of the other ex-German liners.—*Nautical Gazette*, 22 January, 1922.

FIRST AMERICAN SHIP WITH DIESEL ELECTRIC METHOD HAS SEA TEST.—The official sea trials of the motorship *Fordonian*, the first ocean-going merchant ship in the United States to be equipped with the Diesel engine electric method of propulsion, were held successfully last week from the Teboe Yacht Basin of the Todd Shipyards Corporation. A large party of prominent marine engineers and shipping men witnessed the test, under which the ship's performance exceeded the most sanguine expectations.

During the trials she attained a speed of 10.12 knots, and in order to develop full propeller speed of 120 r.p.m. the motor developed 720 h.p. at the propeller shaft. With the ship fully loaded the motor will be called upon to deliver the full rated horse-power of 850 in order to turn the propeller at this speed.

The *Fordonian* represents the culmination of several years of development work in successfully adapting electric transmission to the oil engine for large ships. The electric apparatus is of the General Electric Company type, consisting of two 350 k.w. generators, each driven by a two-cycle four cylinder Ansaldo San Giorgio Diesel engine of 500 brake h.p. Motive power is supplied by a double armature 850 h.p. motor direct connected to the propeller and designed to furnish a speed of about nine to ten knots.

The control is from the engine room and has been devised to give the utmost flexibility of operation. The main control equipment consists of a panel on which are mounted the various switches, field rheostats and instruments; a master controller for operating the contactors of the control

group; the control group for starting and reversing the motor, and a starting resistor and motor field resistor for obtaining lower speed ranges. The normal operating propeller speed is 120 r.p.m. The control arrangement allows for the use of either or both generators supplying current to the propeller motor, depending upon the speed requirements.

The *Fordonian* is 250 feet long with a beam of 42 feet. Her registered tonnage is 2,568. She is owned by the American-Mediterranean Steamship Company, McDonnell & Truda, agents, and will be engaged in coastwise traffic between New York and Havana. She was formerly equipped with straight Diesel engine drive and was converted to electric operation by the Todd Shipyards Corporation, under the supervision of J. Marwitz, superintending engineer for the owners.

The only other commercial ship with a similar drive in this country today is the 200-ton fishing trawler, *Mariner*, equipped with General Electric apparatus and now operating out of Gloucester, Mass.—*Nautical Gazette*, 21 January, 1922.

## TEXT OF TREATIES IN REGARD TO LIMITATION OF ARMAMENTS

### TEXT OF FIVE-POWER NAVAL PACT AS APPROVED IN ARMS PARLEY

#### CHAPTER I

#### General Provisions Relating to the Limitation of Naval Armament

#### ARTICLE I

The contracting Powers agree to limit their respective naval armament as provided in the present treaty.

#### ARTICLE II

The contracting Powers may retain respectively the capital ships which are specified in Chapter II, Part 1. On the coming into force of the present treaty, but subject to the following provisions of this article, all other capital ships, built or building, of the United States, the British Empire and Japan shall be disposed of as prescribed in Chapter II, Part 2.

In addition to the capital ships specified in Chapter II, Part 1, the United States may complete and retain two ships of the *West Virginia* class now under construction. On the completion of these two ships the *North Dakota* and *Delaware* shall be disposed of as prescribed in Chapter II, Part 2.

The British Empire may, in accordance with the replacement table in Chapter II, Part 3, construct two new capital ships not exceeding 35,000 tons (35,560 metric tons) standard displacement each. On the completion of the said two ships the *Thunderer*, *King George V*, *Ajax* and *Centurion* shall be disposed of as prescribed in Chapter II, Part 2.

#### ARTICLE III

Subject to the provisions of Article II, the contracting Powers shall abandon their respective capital ship building programs, and no new capital ships shall be constructed or acquired by any of the contracting Powers except replacement tonnage which may be constructed or acquired as specified in Chapter II, Part 3.

Ships which are replaced in accordance with Chapter II, Part 3, shall be disposed of as prescribed in Part 2 of that chapter.

#### ARTICLE IV

The total capital ship replacement tonnage of each of the contracting Powers shall not exceed in standard displacement, for the United States

525,000 tons (533,400 metric tons); for the British Empire 525,000 tons (533,400 metric tons); for France 175,000 tons (177,800 metric tons); for Italy 175,000 tons (177,800 metric tons); for Japan 315,000 tons (320,040 metric tons).

#### ARTICLE V

No capital ship exceeding 35,000 tons (35,560 metric tons) standard displacement shall be acquired by, or constructed by, for, or within the jurisdiction of, any of the contracting Powers.

#### ARTICLE VI

No capital ship of any of the contracting Powers shall carry a gun with a caliber in excess of sixteen inches (406 millimeters).

#### ARTICLE VII

The total tonnage for aircraft carriers of each of the contracting Powers shall not exceed in standing displacement, for the United States 135,000 tons (137,160 metric tons); for the British Empire 135,000 tons (137,160 metric tons); for France 60,000 tons (60,960 metric tons); for Italy 60,000 tons (60,960 metric tons); for Japan 81,000 tons (82,296 metric tons).

#### ARTICLE VIII

The replacement of aircraft carriers shall be effected only as prescribed in Chapter II, Part 3, provided, however, that all aircraft carrier tonnage in existence or building on November 12, 1921, shall be considered experimental, and may be replaced, within the total tonnage limit prescribed in Article VII, without regard to its age.

#### ARTICLE IX

No aircraft carrier exceeding 27,000 tons (27,432 metric tons) standard displacement shall be acquired by, or constructed by, for or within the jurisdiction of, any of the contracting Powers.

However, any of the contracting Powers may, provided that its total tonnage allowance of aircraft carriers is not thereby exceeded, build not more than two aircraft carriers, each of a tonnage of not more than 33,000 tons (33,528 metric tons) standard displacement, and in order to effect economy any of the contracting Powers may use for this purpose any two of their ships, whether constructed or in course of construction, which would otherwise be scrapped under the provisions of Article II. The armament of any aircraft carriers exceeding 27,000 tons (27,432 metric tons) standard displacement shall be in accordance with the requirements of Article X, except that the total number of guns to be carried in case any of such guns be of a caliber exceeding six inches (152 millimeters), except anti-aircraft guns and guns not exceeding five inches (126.7 millimeters), shall not exceed eight.

#### ARTICLE X

No aircraft carrier of any of the contracting Powers shall carry a gun with a caliber in excess of eight inches (203 millimeters). Without prejudice to the provision of Article IX, if the armament carried includes guns exceeding six inches (152 millimeters) in caliber the total number of guns carried, except anti-aircraft guns and guns not exceeding five inches (126.7 millimeters), shall not exceed ten. If alternatively the armament contains no guns exceeding six inches (152 millimeters) in caliber, the number of guns is not limited. In either case the number of anti-aircraft guns and of guns not exceeding five inches (126.7 millimeters) is not limited.

## ARTICLE XI

No vessel of war exceeding 10,000 tons (10,160 metric tons) standard displacement, other than a capital ship or aircraft carrier, shall be acquired by, or constructed by, for, or within the jurisdiction of, any of the contracting Powers. Vessels not specifically built as fighting ships nor taken in time of peace under government control for fighting purposes which are employed on fleet duties or as troop transports or in some other way for the purpose of assisting in the prosecution of hostilities otherwise than as fighting ships, shall not be within the limitations of this article.

## ARTICLE XII

No vessel of war or any of the contracting Powers, hereafter laid down, other than a capital ship, shall carry a gun with a caliber in excess of eight inches (203 millimeters).

## ARTICLE XIII

Except as provided in Article IX, no ship designated in the present treaty to be scrapped may be reconverted into a vessel of war.

## ARTICLE XIV

No preparations shall be made in merchant ships in time of peace for the installation of warlike armaments for the purpose of converting such ships into vessels of war, other than the necessary stiffening of decks for the mounting of guns not exceeding six-inch (152 millimeters) caliber.

## ARTICLE XV

No vessel of war constructed within the jurisdiction of any of the contracting Powers for a non-contracting Power shall exceed the limitations as to displacement and armament prescribed by the present treaty for vessels of a similar type which may be constructed by or for any of the contracting Powers; provided, however, that the displacement for aircraft carriers constructed for a non-contracting Power shall in no case exceed 27,000 tons (27,432 metric tons) standard displacement.

## ARTICLE XVI

If the construction of any vessel of war for a non-contracting Power is undertaken within the jurisdiction of any of the contracting Powers, such Power shall promptly inform the other contracting Powers of the date of the signing of the contract and the date on which the keel of the ship is laid; and shall also communicate to them the particulars relating to the ship prescribed in Chapter II, Part 3, Section I (b), (4) and (5).

## ARTICLE XVII

In the event of a contracting Power being engaged in war, such Power shall not use as a vessel of war any vessel of war which may be under construction within its jurisdiction for any other Power, or which may have been constructed within its jurisdiction for another Power and not delivered.

## ARTICLE XVIII

Each of the contracting Powers undertakes not to dispose by gift, sale or any mode of transfer of any vessel of war in such a manner that such vessel may become a vessel of war in the navy of any foreign Power.

## ARTICLE XIX

The United States, the British Empire and Japan agree that the *status quo* at the time of the signing of the present treaty, with regard to fortifications and naval bases, shall be maintained in their respective territories and possessions specified hereunder:

(1) The insular possessions which the United States now holds or may hereafter acquire in the Pacific Ocean, except (a) those adjacent to the coast of the United States, Alaska and the Panama Canal Zone, not including the Aleutian Islands, and (b) the Hawaiian Islands.

(2) Hongkong and the insular possessions which the British Empire now holds or may hereafter acquire in the Pacific Ocean, east of the meridian of 110 degrees east longitude, except (a) those adjacent to the coast of Canada, (b) the Commonwealth of Australia and its territories, and (c) New Zealand.

(3) The following insular territories and possessions of Japan in the Pacific Ocean, to wit: the Kurile Islands, the Bonin Islands, Amami-Oshima, the Loochoo Islands, Formosa and the Pescadores, and any insular territories or possessions in the Pacific Ocean which Japan may hereafter acquire.

The maintenance of the *status quo* under the foregoing provisions implies that no new fortifications or naval bases shall be established in the territories and possessions specified; that no measures shall be taken to increase the existing naval facilities for the repair and maintenance of naval forces, and that no increase shall be made in the coast defense of the territories and possessions above specified. This restriction, however, does not preclude such repair and replacement of worn-out weapons and equipment as is customary in naval and military establishments in time of peace.

## ARTICLE XX

The rules for determining tonnage displacements prescribed in Chapter II, Part 4, shall apply to the ships of each of the Contracting Powers.

## CHAPTER II

### Rules Relating to the Execution of the Treaty—Definition of Terms

#### PART I

Capital ships which may be retained by the contracting Powers.—In accordance with Article II ships may be retained by each of the Contracting Powers as specified in this Part.

#### SHIPS WHICH MAY BE RETAINED BY THE UNITED STATES

Name	Tonnage
Maryland.....	32,600
California.....	32,300
Tennessee.....	32,300
Idaho.....	32,300
New Mexico.....	32,000
Mississippi.....	32,000
Arizona.....	31,400
Pennsylvania.....	31,400
Oklahoma.....	27,500
Nevada.....	27,500
New York.....	27,500
Texas.....	27,000
Arkansas.....	26,000
Wyoming.....	26,000
Florida.....	21,825
Utah.....	21,825
North Dakota.....	20,000
Delaware.....	20,000
Total tonnage.....	500,650

On the completion of the two ships of the *West Virginia* class and the scrapping of the *North Dakota* and *Delaware*, as provided in Article II, the total tonnage to be retained by the United States will be 525,850 tons.

## SHIPS WHICH MAY BE RETAINED BY THE BRITISH EMPIRE

Name	Tonnage
<i>Royal Sovereign</i> .....	25,750
<i>Royal Oak</i> .....	25,750
<i>Revenge</i> .....	25,750
<i>Resolution</i> .....	25,750
<i>Ramillies</i> .....	25,750
<i>Malaya</i> .....	27,500
<i>Valiant</i> .....	27,500
<i>Barham</i> .....	27,500
<i>Queen Elizabeth</i> .....	27,500
<i>Warspite</i> .....	27,500
<i>Bendow</i> .....	25,000
<i>Emperor of India</i> .....	25,000
<i>Iron Duke</i> .....	25,000
<i>Marlborough</i> .....	25,000
<i>Hood</i> .....	41,200
<i>Renown</i> .....	26,500
<i>Repulse</i> .....	26,500
<i>Tiger</i> .....	23,500
<i>Thunder</i> .....	22,500
<i>King George V</i> .....	23,000
<i>Ajax</i> .....	23,000
<i>Centurion</i> .....	23,000
Total tonnage.....	580,450

On the completion of the two new ships to be constructed and the scrapping of the *Thunderer*, *King George V*, *Ajax* and *Centurion*, as provided in Article II, the total tonnage to be retained by the British Empire will be 558,950 tons.

## SHIPS WHICH MAY BE RETAINED BY FRANCE

Name	Tonnage (metric tons)
<i>Bretagne</i> .....	23,500
<i>Lorraine</i> .....	23,500
<i>Provence</i> .....	23,500
<i>Paris</i> .....	23,500
<i>France</i> .....	23,500
<i>Jean Bart</i> .....	23,500
<i>Courbet</i> .....	23,500
<i>Condorcet</i> .....	18,890
<i>Diderot</i> .....	18,890
<i>Voltaire</i> .....	18,890
Total tonnage.....	221,170

France may lay down new tonnage in the years 1927, 1929, and 1931, as provided in Part 3, Section II.

## SHIPS WHICH MAY BE RETAINED BY ITALY

Name	Tonnage (metric tons)
<i>Andrea Doria</i> .....	22,700
<i>Caio Duilio</i> .....	22,700
<i>Conte Di Cavour</i> .....	22,500
<i>Giulio Cesare</i> .....	22,500
<i>Leonardo da Vinci</i> .....	22,500
<i>Dante Alighieri</i> .....	19,500
<i>Roma</i> .....	12,600
<i>Napoli</i> .....	12,600
<i>Vittorio Emanuele</i> .....	12,600
<i>Regina Elena</i> .....	12,600
Total tonnage.....	182,800



Italy may lay down new tonnage in the years 1927, 1929, and 1931, as provided in Part 3, Section II.

## SHIPS WHICH MAY BE RETAINED BY JAPAN

Name	Tonnage
<i>Mutsu</i> .....	33,800
<i>Nagato</i> .....	33,800
<i>Hiraga</i> .....	31,260
<i>Ise</i> .....	31,260
<i>Yamashiro</i> .....	30,600
<i>Fuso</i> .....	30,600
<i>Kirishima</i> .....	27,500
<i>Haruna</i> .....	27,500
<i>Hiei</i> .....	27,500
<i>Kongo</i> .....	27,500
Total tonnage.....	301,320

## PART 2

Rules for scrapping vessels of war—The following rules shall be observed for the scrapping of vessels of war which are to be disposed of in accordance with Articles II and III.

I. A vessel to be scrapped must be placed in such condition that it cannot be put to combatant use.

II. This result must be finally effected in any one of the following ways:

(a) Permanent sinking of the vessel;  
 (b) Breaking the vessel up. This shall always involve the destruction or removal of all machinery, boilers and armor, and all deck, side and bottom plating;

(c) Converting the vessel to target use exclusively. In such case all the provisions of paragraph III of this part, except sub-paragraph (6), in so far as may be necessary to enable the ship to be used as a mobile target (7), must be previously complied with. Not more than one capital ship may be retained for this purpose at one time by any of the contracting Powers.

(d) Of the capital ships which would otherwise be scrapped under the present treaty in or after the year 1931, France and Italy may each retain two sea-going vessels for training purposes exclusively, that is, as gunnery or torpedo schools. The two vessels retained by France shall be of the *Jean Bart* class, and of those retained by Italy one shall be the *Dante Alighieri*, the other of the *Guilio Cesare* class. On retaining these ships for the purpose above stated, France and Italy respectively undertake to remove and destroy their conning-towers, and not to use the said ships as vessels of war.

III. (a) Subject to the special exceptions contained in Article IX, when a vessel is due for scrapping, the first stage of scrapping, which consists in rendering a ship incapable of further warlike service, shall be immediately undertaken.

(b) A vessel shall be considered incapable of further warlike service when there shall have been removed and landed, or else destroyed in the ship:

- (1) All guns and essential portions of guns, fire-control tops and revolving parts of all barbettes and turrets;
- (2) All machinery for working hydraulic or electric mountings;
- (3) All fire-control instruments and range-finders;
- (4) All ammunition, explosives and mines;
- (5) All torpedos, war-heads and torpedo-tubes;
- (6) All wireless telegraphy installations;
- (7) The conning tower and all side armor, or alternatively all main propelling machinery; and

(8) All landing and flying-off platforms and all other aviation accessories.

IV. The periods in which scrapping of vessels is to be effected are as follows:

(a) In the case of vessels to be scrapped under the first paragraph of Article II, the work of rendering the vessels incapable of further warlike service in accordance with paragraph III of this part, shall be completed within six months from the coming into force of the present treaty, and the scrapping shall be finally effected within eighteen months from such coming into force.

(b) In the case of vessels to be scrapped under the second and third paragraphs of Article II, or under Article III, the work of rendering the vessel incapable of further warlike service in accordance with paragraph III of this part shall be commenced not later than the date of completion of its successor, and shall be finished within six months from the date of such completion. The vessel shall be finally scrapped, in accordance with paragraph II of this part, within eighteen months from the date of completion of its successor. If, however, the completion of the new vessel be delayed, then the work of rendering the old vessel incapable of further warlike service in accordance with paragraph III of this part shall be commenced within four years from the laying of the keel of the new vessel, and shall be finished within six months from the date on which such work was commenced, and the old vessel shall be finally scrapped in accordance with paragraph II of this part within eighteen months from the date when the work of rendering it incapable of further warlike service was commenced.

### PART 3

Replacement.—The replacement of capital ships and aircraft carriers shall take place according to the rules in Section I and the tables in Section II of this part.

SECTION I.—Rules for replacement—(a) Capital ships and aircraft carriers twenty years after the date of their completion may, except as otherwise provided in Article VIII and in the tables in Section II of this Part, be replaced by new construction, but within the limits prescribed in Article IV and Article VII. The keels of such new construction may, except as otherwise provided in Article VIII and in the tables in Section II of this Part, be laid down not earlier than seventeen years from the date of completion of the tonnage to be replaced, provided, however, that no capital ship tonnage, with the exception of the ships referred to in the third paragraph of Article II, and the replacement tonnage specifically mentioned in Section II of this Part, shall be laid down ten years from November 12, 1921.

(b) Each of the contracting Powers shall communicate promptly to each of the other contracting Powers the following information:

(1) The names of the capital ships and aircraft carriers to be replaced by new construction;

(2) The date of governmental authorization of replacement tonnage;

(3) The date of laying the keels of replacement tonnage;

(4) The standard displacement in tons and metric tons of each new ship to be laid down, and the principal dimensions, namely, length at waterline, extreme beam at or below waterline, mean draft at standard displacement;

(5) The date of completion of each new ship and its standard displacement in tons and metric tons, and the principal dimensions, namely, length at waterline, extreme beam at or below waterline, mean draft at standard displacement, at time of completion.

(c) In case of loss or accidental destruction of capital ships or aircraft carriers, they may immediately be replaced by new construction subject to the tonnage limits prescribed in Articles IV and VII and in conformity with the other provisions of the present treaty, the regular replacement program being deemed to be advanced to that extent.

(d) No retained capital ships or aircraft carriers shall be reconstructed except for the purpose of providing means of defense against air and submarine attack, and subject to the following rules: The contracting Powers may, for that purpose, equip existing tonnage with bulge or blister or anti-air attack deck protection, providing the increase of displacement thus effected does not exceed 3,000 tons (3,048 metric tons) displacement for each ship. No alterations in side armor, in caliber, number or general type of mounting of main armament shall be permitted except:

(1) In the case of France and Italy, which countries within the limits allowed for bulge may increase their armor protection and the caliber of the guns now carried on their existing capital ships so as not to exceed sixteen inches (406 millimeters) and

(2) the British Empire shall be permitted to complete, in the case of the *Renown*, the alterations to armor that have already been commenced but temporarily suspended.

## SECTION II

## REPLACEMENT AND SCRAPPING OF CAPITAL SHIPS UNITED STATES

Year	Ships laid down	Ships completed	Ships scrapped (age in parentheses)	Ships retained Pre- Post- Jutland
			<i>Maine</i> (20), <i>Missouri</i> (20), <i>Virginia</i> (17), <i>Nebraska</i> (17), <i>Georgia</i> (17), <i>New Jersey</i> (17), <i>Rhode Island</i> (17), <i>Connecticut</i> (17), <i>Louisiana</i> (17), <i>Vermont</i> (16), <i>Kansas</i> (16), <i>Minnesota</i> (16), <i>New Hampshire</i> (15), <i>South Carolina</i> (13), <i>Michigan</i> (13), <i>Washington</i> (0), <i>South Dakota</i> (0), <i>Indiana</i> (0), <i>Montana</i> (0), <i>North Carolina</i> (0), <i>Iowa</i> (0), <i>Massachusetts</i> (0), <i>Lexington</i> (0), <i>Constitution</i> (0), <i>Constellation</i> (0), <i>Saratoga</i> (0), <i>Ranger</i> (0), <i>United States</i> (0).*	17 1
1922		A, B†	<i>Delaware</i> (12), <i>North Dakota</i> (12)	15 3
1923				15 3
1924				15 3
1925				15 3
1926				15 3
1927				15 3
1928				15 3
1929				15 3
1930				15 3
1931	C, D			15 3
1932	E, F			15 3
1933	G			15 3
1934	H, I	C, D	<i>Florida</i> (23), <i>Utah</i> (23), <i>Wyoming</i> (22)	12 5
1935	J	E, F	<i>Arkansas</i> (23), <i>Tezas</i> (21), <i>New York</i> (21)	9 7
1936	K, L	G	<i>Nevada</i> (20), <i>Oklahoma</i> (20)	7 8
1937	M	H, I	<i>Arizona</i> (21), <i>Pennsylvania</i> (21)	5 10
1938	N, O	J	<i>Mississippi</i> (21)	4 11
1939	P, Q	K, L	<i>New Mexico</i> (21), <i>Idaho</i> (20)	2 13
1940		M	<i>Tennessee</i> (20)	1 14
1941		N, O	<i>California</i> (20), <i>Maryland</i> (20)	0 15
1942		P, Q	2 ships <i>West Virginia</i> class	0 15

\*The United States may retain the *Oregon* and *Illinois*, for noncombatant purposes, after complying with the provisions of Part 2, III, (b).

†Two *West Virginia* class.

Note—A, B, C, D, etc., represent individual capital ships of 35,000 tons standard displacement, laid down and completed in the years specified.

## REPLACEMENT AND SCRAPPING OF CAPITAL SHIPS BRITISH EMPIRE

Year	Ships laid down	Ships completed	Ships scrapped (age in parentheses)	Ships retained	
				Pre-Jutland	Post-Jutland
			<i>Commonwealth</i> (16), <i>Agamemnon</i> (13), <i>Dreadnought</i> (15), <i>Bellerophon</i> (12), <i>St. Vincent</i> (11), <i>Inflexible</i> (13), <i>Superb</i> (12), <i>Neptune</i> (10), <i>Hercules</i> (10), <i>Indomitable</i> (13), <i>Temeraire</i> (12), <i>New Zealand</i> (9), <i>Lion</i> (9), <i>Princess Royal</i> (9), <i>Conqueror</i> (9), <i>Monarch</i> (9), <i>Orion</i> (9), <i>Australia</i> (9), <i>Agincourt</i> (7), <i>Erin</i> (7), 4 building or projected.*	21	1
1922	A, B †			21	1
1923				21	1
1924				21	1
1925	A, B		<i>King George V</i> (13), <i>Ajax</i> (12), <i>Centurion</i> (12), <i>Thunderer</i> (13)	17	3
1926				17	3
1927				17	3
1928				17	3
1929				17	3
1930				17	3
1931	C, D			17	3
1932	E, F			17	3
1933	G			17	3
1934	H, I	C, D	<i>Iron Duke</i> (20), <i>Marlborough</i> (20), <i>Emperor of India</i> (20), <i>Benbow</i> (20)	13	5
1935	J	E, F	<i>Tiger</i> (21), <i>Queen Elizabeth</i> (20), <i>Warspite</i> (20), <i>Barham</i> (20)	9	7
1936	K, L	G	<i>Malaya</i> (20), <i>Royal Sovereign</i> (20)	7	8
1937	M	H, I	<i>Revenge</i> (21), <i>Resolution</i> (21)	5	10
1938	N, O	J	<i>Royal Oak</i> (22)	4	11
1939	P, Q	K, L	<i>Valiant</i> (23), <i>Repulse</i> (23)	2	13
1940		M	<i>Renown</i> (24)	1	14
1941		N, O	<i>Ramillies</i> (24), <i>Hood</i> (21)	0	15
1942		P, Q	<i>A</i> (17), <i>B</i> (17)	0	15

\*The British Empire may retain the *Colossus* and *Collingwood* for noncombatant purposes, after complying with the provisions of Part 2, III (b).

†Two 35,000-ton ships, standard displacement.

NOTE—A, B, C, D, etc., represent individual capital ships of 35,000 tons standard displacement laid down and completed in the years specified.

## REPLACEMENT AND SCRAPPING OF CAPITAL SHIPS FRANCE

Year	Ships laid down	Ships completed	Ships scrapped (age in parentheses)	Ships retained	
				Pre-Jutland	Post-Jutland
1922				7	0
1923				7	0
1924				7	0
1925				7	0
1926				7	0
1927	35,000 tons			7	0
1928				7	0
1929	35,000 tons			7	0
1930		35,000 tons	<i>Jean Bart</i> (17), <i>Courbet</i> (17)	5	(*)
1931	35,000 tons			5	(*)
1932	35,000 tons	35,000 tons	<i>France</i> (18)	4	(*)
1933	35,000 tons			4	(*)
1934		35,000 tons	<i>Paris</i> (20), <i>Bretagne</i> (20)	2	(*)
1935		35,000 tons	<i>Provence</i> (20)	1	(*)
1936		35,000 tons	<i>Lorraine</i> (20)	0	(*)
1937				0	(*)
1938				0	(*)
1939				0	(*)
1940				0	(*)
1941				0	(*)
1942				0	(*)

\*Within tonnage limitations; number not fixed.

NOTE—France expressly reserves the right of employing the capital ship tonnage allotment as she may consider advisable, subject solely to the limitations that the displacement of individual ships should not surpass 35,000 tons, and that the total capital ship tonnage should keep within the limits imposed by the present Treaty.

## REPLACEMENT AND SCRAPPING OF CAPITAL SHIPS ITALY

Year	Ships laid down	Ships completed	Ships scrapped (age in parentheses)	Ships retained Summary	
				Pre- Jutland	Post- Jutland
1922				6	0
1923				6	0
1924				6	0
1925				6	0
1926				6	0
1927	35,000 tons			6	0
1928				6	0
1929	35,000 tons			6	0
1930				6	0
1931	35,000 tons	35,000 tons	<i>Dante Alighiere</i> (19)	5	(*)
1932	45,000 tons			5	(*)
1933	25,000 tons	35,000 tons	<i>Leonardo da Vinci</i> (19)	4	(*)
1934				4	(*)
1935	35,000 tons		<i>Giulio Cesare</i> (21)	3	(*)
1936		45,000 tons	<i>Conte di Cavour</i> (21), <i>Duilio</i> (21)	1	(*)
1937		25,000 tons	<i>Andrea Doria</i> (21)	0	(*)

\*Within tonnage limitations; number not fixed.

NOTE—Italy expressly reserves the right of employing the capital ship tonnage allotment as she may consider advisable, subject solely to the limitations that the displacement of individual ships should not surpass 35,000 tons, and the total capital ship tonnage should keep within the limits imposed by the present treaty.

## REPLACEMENT AND SCRAPPING OF CAPITAL SHIPS JAPAN

Year	Ships laid down	Ships completed	Ships scrapped (age in parentheses)	Ships retained Summary	
				Pre- Jutland	Post- Jutland
			<i>Hizen</i> (20), <i>Mikasa</i> (20), <i>Kashima</i> (16), <i>Katori</i> (16), <i>Satsuma</i> (12), <i>Aki</i> (11), <i>Settsu</i> (10), <i>Ikoma</i> (14), <i>Ibuki</i> (12), <i>Kurama</i> (11), <i>Amagi</i> (0), <i>Akagi</i> (0), <i>Kaga</i> (0), <i>Tosa</i> (0), <i>Takao</i> (0), <i>Atago</i> (0). Projected program		
			8 ships not laid down.*	8	2
1922				8	2
1923				8	2
1924				8	2
1925				8	2
1926				8	2
1927				8	2
1928				8	2
1929				8	2
1930				8	2
1931				8	2
1931	A			8	2
1932	B			8	2
1933	C			8	2
1934	D	A	<i>Kongo</i> (21)	7	3
1935	E	B	<i>Hiyei</i> (21), <i>Haruna</i> (20)	5	4
1936	F	C	<i>Kirishima</i> (21)	4	5
1937	G	D	<i>Fuso</i> (22)	3	6
1938	H	E	<i>Yamashiro</i> (21)	2	7
1939	I	F	<i>Ise</i> (22)	1	8
1940		G	<i>Hiuga</i> (22)	0	9
1941		H	<i>Nagato</i> (21)	0	9
1942		I	<i>Mutsu</i> (21)	0	9

\*Japan may retain the *Shikishima* and *Asahi* for noncombatant purposes, after complying with the provisions of Part 2, III, (b).

NOTE—A, B, C, D, etc., represent individual capital ships of 35,000 tons standard displacement laid down and completed in the years specified.

## NOTE APPLICABLE TO ALL TABLES IN SECTION II

The order above prescribed in which ships are to be scrapped is in accordance with their age. It is understood that when replacement begins according to the above tables the order of scrapping in the case of the ships of each of the contracting Powers may be varied at its option; provided, however, that such Power shall scrap in each year the number of ships above stated.

## PART 4

## Definitions

For the purposes of the present treaty, the following expressions are to be understood in the sense defined in this part.

**Capital Ship**—A capital ship, in the case of ships hereafter built, is defined as a vessel of war, not an aircraft carrier, whose displacement exceeds 10,000 tons (10,160 metric tons) standard displacement, or which carries a gun with a calibre exceeding eight inches (203 millimeters).

**Aircraft Carrier**—An aircraft carrier is defined as a vessel of war with a displacement in excess of 10,000 tons (10,160 metric tons) standard displacement designed for the specific and exclusive purpose of carrying aircraft. It must be so constructed that aircraft can be launched therefrom and landed thereon, and not designed and constructed for carrying a more powerful armament than that allowed to it under Article IX or Article X as the case may be.

**Standard Displacement**—The standard displacement of a ship is the displacement of the ship complete, fully manned, engined, and equipped ready for sea, including all armament and ammunition, equipment, outfit, provisions and fresh water for crew, miscellaneous stores and implements of every description that are intended to be carried in war, but without fuel or reserve feed water on board.

The word "ton" in the present treaty, except in the expression "metric tons," shall be understood to mean the ton of 2240 pounds (1016 kilo).

Vessels now completed shall retain their present ratings of displacement tonnage in accordance with their national system of measurement. However, a Power expressing displacement in metric tons shall be considered for the application of the present Treaty as owning only the equivalent displacement in tons of 2240 pounds.

A vessel completed hereafter shall be rated at its displacement tonnage when in the standard condition defined herein.

## CHAPTER III

## Miscellaneous Provisions

## ARTICLE XXI

If during the term of the present treaty the requirements of the national security of any contracting Power in respect of naval defense are, in the opinion of that Power, materially affected by any change of circumstances, the contracting Powers will, at the request of such Power, meet in conference with a view to the reconsideration of the provisions of the treaty and its amendment by mutual agreement.

In view of possible technical and scientific developments, the United States, after consultation with the other contracting Powers, shall arrange for a conference of all the contracting Powers, which shall convene as soon as possible after the expiration of eight years from the coming into force of the present treaty to consider what changes, if any, in the treaty may be necessary to meet such developments.

## ARTICLE XXII

Whenever any contracting Power shall become engaged in a war which in its opinion affects the naval defense of its national security, such Power may, after notice to the other contracting Powers suspend for the period of hostilities its obligations under the present treaty other than those under Articles XIII and XVII, provided that such Power shall notify the other contracting Powers that the emergency is of such a character as to require such suspension.

The remaining contracting Powers shall in such case consult together with a view to agreement as to what temporary modifications, if any, should be made in the treaty as between themselves. Should such consultation not produce agreement, duly made in accordance with the constitutional methods of the respective Powers, any one of said contracting Powers may, by giving notice to the other contracting Powers, suspend for the period of hostilities its obligations under the present treaty, other than those under Articles XIII and XVII.

On the cessation of hostilities the contracting Powers will meet in conference to consider what modifications, if any, should be made in the provisions of the present treaty.

#### ARTICLE XXIII

The present treaty shall remain in force until December 31, 1936, and in case none of the contracting Powers shall have given notice two years before that date of its intention to terminate the treaty, it shall continue in force until the expiration of two years from the date on which notice of termination shall be given by one of the contracting Powers, whereupon the treaty shall terminate as regards all the contracting Powers. Such notice shall be communicated in writing to the Government of the United States, which shall immediately transmit a certified copy of the notification to the other Powers and inform them of the date on which it was received. The notice shall be deemed to have been given and shall take effect on that date. In the event of notice of termination being given by the Government of the United States, such notice shall be given to the diplomatic representatives at Washington of the other contracting Powers, and the notice shall be deemed to have been given and shall take effect on the date of the communication made to the said diplomatic representatives.

Within one year of the date on which a notice of termination by any Power has taken effect, all the contracting Powers shall meet in conference.

#### ARTICLE XXIV

The present treaty shall be ratified by the contracting Powers in accordance with their respective constitutional methods and shall take effect on the date of the deposit of all the ratifications, which shall take place at Washington as soon as possible. The Government of the United States will transmit to the other contracting Powers a certified copy of the proces-verbal of the deposit of ratifications.

The present treaty, of which the English and French texts are both authentic, shall remain deposited in the archives of the Government of the United States, and duly certified copies thereof shall be transmitted by that Government to the other contracting Powers.

In faith where of the above-named plenipotentiaries have signed the present treaty.

Done at the City of Washington the . . . . day of . . . . One thousand nine hundred and twenty-two.

#### TEXT OF FIVE-POWER TREATY CURBING SUBMARINE AND CHEMICAL WARFARE

The United States of America, the British Empire, France, Italy and Japan, hereinafter referred to as the signatory Powers, desiring to make more effective the rules adopted by civilized nations for the protection of the lives of neutrals and noncombatants at sea in time of war, and to prevent the use in war of noxious gases and chemicals, have determined to conclude a treaty to this effect and have appointed as their plenipotentiaries:

The President of the United States of America:

Charles Evans Hughes,

Henry Cabot Lodge,

Oscar W. Underwood,

Elihu Root, citizens of the United States;

His Majesty the King of the United Kingdom of Great Britain and Ireland and of the British Dominions Beyond the Seas, Emperor of India:

The Right Honourable, Arthur James Balfour, O. M., M. P., Lord President of His Privy Council;

The Right Honourable Baron Lee of Fareham, G. B. E., K. C. B., First Lord of His Admiralty;

The Right Honourable Sir Auckland Campbell Geddes, K. C. B., His Ambassador Extraordinary and Plenipotentiary to the United States of America;

And,

For the Dominion of Canada:

The Right Honourable Sir Robert Laird Borden, M. C. M. G. K. C.;

For the Commonwealth of Australia:

Senator the Right Honourable George Foster Pearce, Minister for Home and Territories;

For the Dominion of New Zealand:

The Honourable Sir John William Salmond, K. C., Judge of the Supreme Court of New Zealand;

For the Union of South Africa:

The Right Honourable Arthur James Balfour, O. M., M. P.;

For India:

The Right Honourable Valingman Sankaranarayana Srinivasa Sastri, member of the Indian Council of State;

The President of the French Republic:

Mr. Albert Sarraut, Deputy Minister of the Colonies;

Mr. Jules J. Jusserand, Ambassador Extraordinary and Plenipotentiary to the United States of America, Grand Cross of the National Order of Legion of Honour;

His Majesty the King of Italy:

The Honourable Carlo Schanzer, Senator of the Kingdom;

The Honourable Vittorio Rolandi Ricci, Senator of the Kingdom, His Ambassador Extraordinary and Plenipotentiary at Washington;

The Honourable Luigi Albertini, Senator of the Kingdom;

His Majesty the Emperor of Japan:

Baron Tomosaburo Kato, Minister for the Navy, Junii, a member of the First Class of the Imperial Order of the Grand Cordon of the Rising Sun with the Paulownia Flower;

Baron Kijuro Shidehara, His Ambassador Extraordinary and Plenipotentiary at Washington, Joshii, a member of the First Class of the Imperial Order of the Rising Sun;

Mr. Masanao Hanihara, Vice Minister for Foreign Affairs, Jushii, a member of the Second Class of the Imperial Order of the Rising Sun;

Who, having communicated their Full Powers, found in good and due form have agreed as follows:

Section 1. The signatory Powers declare that, among the rules adopted by civilized nations for the protection of the lives of neutrals and non-combatants at sea in time of war, the following are to be deemed an established part of international law:

(1) A merchant vessel must be ordered to submit to visit and search to determine its character before it can be seized.



A merchant vessel must not be attacked unless it refuse to submit to visit and search after warning, or to proceed as directed after seizure.

A merchant vessel must not be destroyed unless the crew and passengers have been first placed in safety.

(2) Belligerent submarines are not under any circumstances exempt from the universal rules above stated, and if a submarine cannot capture a merchant vessel in conformity with these rules, the existing law of nations requires it to desist from attack and from seizure and to permit the merchant vessel to proceed unmolested.

#### Other Powers Asked to Assent

Section II. The signatory Powers invite all other civilized Powers to express their assent to the foregoing statement of established law, so that there may be a clear public understanding throughout the world of the standards of conduct by which the public opinion of the world is to pass judgment upon future belligerents.

Section III. The signatory Powers, desiring to insure the enforcement of the humane rules of existing law declared by them with respect to attacks upon and the seizure and destruction of merchant ships, further declare that any person in service of any Power who shall violate any of those rules, whether or not such person is under orders of a governmental superior, shall be deemed to have violated the laws of war and shall be liable to trial and punishment as if for an act of piracy, and may be brought to trial before the civil or military authorities of any Power within the jurisdiction of which he may be found.

Section IV.—The signatory Powers recognize the practical impossibility of using submarines as commerce destroyers without violating, as they were violated in the war of 1914-1918, the requirements universally accepted by civilized nations for the protection of the lives of neutrals and noncombatants; and to the end that the prohibition of the use of submarines as commerce destroyers shall be universally accepted as a part of the law of nations, they now accept that prohibition as henceforth binding as between themselves, and they invite all other nations to adhere thereto.

#### Poison Gas Prohibited

Section V—The use in war of asphyxiating, poisonous or other gases, and all analogous liquids, materials or devices, having justly been condemned by the public opinion of the civilized world and a prohibition of such use having been declared in treaties to which a majority of the civilized Powers are parties, the signatory Powers, to the end that this prohibition shall be universally accepted as a part of international law, binding alike the conscience and practice of nations, declare their assent to such prohibition, agree to be bound thereby as between themselves and invite all other civilized nations to adhere thereto.

Section VI—The present treaty shall be ratified as soon as possible in accordance with the constitutional methods of the signatory Powers, and shall take effect on the deposit of all the ratifications, which shall take place at Washington.

The Government of the United States of America will transmit to all the signatory Powers a certified copy of the process-verbal of the deposit of ratifications.

The present treaty, in French and in English, shall remain deposited in the archives of the Government of the United States of America, and duly certified copies thereof will be transmitted by that Government to each of the signatory Powers.

Section VII—The Government of the United States of America will further transmit to each of the non-signatory Powers a duly certified copy of the present treaty and invite its adherence thereto.

Any non-signatory Power may adhere to the present treaty by communicating an instrument of adherence to the Government of the United States of America, which will thereupon transmit to each of the signatory and adhering Powers a certified copy of each instrument of adherence.

In faith whereof, the above-named plenipotentiaries have signed the present treaty.—*Public Ledger Bureau*, Washington, 1 February.

HOW POWERS WILL STAND IN SEAPOWER BY NEW PACT.—A summary of the naval limitation treaty adopted by the five big naval Powers today, gives the following figures:

	Number of capital ships retained	Their total tonnage	Replacements not to cause tonnage excess	Tonnage of aircraft carriers
U. S. ....	18	500,650	525,000	135,000
Britain. ....	22	580,450	525,000	135,000
France. ....	9	221,171	175,000	60,000
Italy. ....	10	182,800	175,000	60,000
Japan. ....	9	301,320	315,000	81,000

—*Public Ledger Bureau*, Washington, 1 February.

### AERONAUTICS

FRENCH GUIDE CABLE FOR FOG.—Admiral Fournier has communicated to the Academie des Sciences an account of successful tests of apparatus for the guidance of planes to their aerodromes by night or in fog carried out at Villacoublay by Lieutenant Loth of the French navy.

After more than a year's work Lieutenant Loth, who worked out a system of guiding ships into port in the thickest fog by wireless a couple of years ago, has devised a similar apparatus for planes which adds less than 10 lb. to the weight of the machine. On ground there is a guiding cable with an alternating current of 600 vibrations per second. In the machine there are three receiving devices. One of them records a deep and loud musical sound—which the pilot hears with the aid of ear-pieces fixed in his helmet—so long as the machine is flying parallel with the cable. The sound diminishes when the direction of the machine makes an angle with the cable and ceases altogether when the direction is at right angles to the cable. The second spiral records its loudest sound when the machine is flying at right angles to the cable and ceases to record when the plane is going parallel. The sound recorded by the third spiral varies according to the distance of the machine from the cable, but it stops dead the moment the machine crosses the cable. The sound can be caught as high up as 10,000 ft. and for a mile and a half on either side of the cable.

The first experiments failed because the sounds were drowned by the noise of the motors, but ear-pieces fixed in the helmets have overcome this difficulty.—*Aviation*, 30 January, 1922.

NAVAL AVIATION OFFICERS TO GERMANY.—The first detachment of naval aviation officers ordered to Germany to supervise and inspect the construction of the *L-71* type rigid airship authorized by the Allied Council has left the United States.

Lt. Comdr. Zachary Lansdowne, U. S. N., who has been in charge of the Lighter-than-Air Branch of the Bureau of Naval Aeronautics was

detached from that service on January 16 and detailed as assistant naval attaché at Berlin, Germany, where his duties will also include the supervision of the German commercial airship soon to be undertaken at Friederichshafen, Germany. Commander Lansdowne, an expert on lighter-than-air craft, made the trans-Atlantic trip on the British airship *R-34* in July 1919, being the only American on the trip over.

Lt. Comdr. G. Fulton, of the construction department of Naval Aviation, has been ordered to proceed to Germany to organize a bureau of aeronautical inspection.

It is understood that Lieut. R. G. Pennoyer, a survivor of the American *ZR-2* detachment Howden, may also be detailed to inspection duty in connection with the building of the Navy's great rigid airship.—*Aviation*, 30 January, 1922.

**VARIABLE PITCH PROPELLER DEMONSTRATION.**—There has been on demonstration at the works of The American Propeller & Mfg. Co., Baltimore, Md. a propeller designed by Spencer Heath and now in operation on a 4,000-pound land machine under full load and power conditions. The blades of this propeller can be adjusted universally in their sockets for any angle of forward or reverse pitch while the engine is running, the power of the engine itself being used to effect the changes of pitch. A light pull or pressure on a button is all that is required to produce any change of pitch desired. When the engine is at rest the pitch may be altered or reversed by turning a small hand crank located conveniently to the operator. At all times and during all changes of pitch the exact position of the blades is graphically shown by an indicator on the instrument board.

The speed of the engine is automatically controlled by the indicator mechanism so as to give the correct throttle position for every possible blade position and thus prevent racing or stalling the engine by manipulation of the pitch. The engine is subject at all times, however, to manual control of the throttle which may at any time interrupt and supervene upon the automatic throttle control. The entire operating mechanism is entirely disengaged and the blades securely locked at all times except during change or adjustment of the pitch.

Mr. Heath has worked on this invention for a couple of years and is most enthusiastic about it in connection with airships.

In discussing his invention Mr. Heath said:

"The average airship of the Zeppelin type is at the mercy of the wind and runs an enormous risk every time a landing is necessary. The crew has to maneuver the huge boats so that the rudders can be brought into play and act as brakes. With my variable or universal pitch propeller the dirigible can make its own wind and can reverse or go ahead as easily as a steamship entering her dock."—*Aviation*, 23 January, 1922.

**WORLD'S ENDURANCE RECORD ESTABLISHED.**—Flying continuously for 26 hours, 19 minutes and 35 seconds in gales, snow and a zero temperature, Edward Stinson and Lloyd Bertaud in a Larsen all-metal monoplane at Roosevelt Field, near Mineola, L. I., set a new world's record December 30, for sustained flight in a heavier-than-air machine. Averaging 85 miles an hour in circling above the flying field and surrounding country, the monoplane traveled at least 2,200 miles, or, translated into land distance, the equivalent of the Pacific gap between California and Hawaii.

Had the plane flown straightaway the pilots would have landed in Reno, Nev. The feat was all the more remarkable when it is compared with the previous endurance record of 24 hours, 19 minutes and 2 seconds made in France by Lucien Boussoutroy and Jean Bernard. Their flight

was made on a clear day in June of last year after careful preparation. Stinson and Bertaud agreed to make the attempt for J. L. Larsen, designer of the plane, the day before the start of the flight.

Numb with cold and exhausted by lack of sleep, Stinson and Bertaud brought the monoplane down to earth at 11:17:50 o'clock A. M., December 30. They both maintained that they would have remained up several hours longer had they not been forced to descend by reason of a faulty oil connection with which they had been struggling since three o'clock in the morning.—*Aerial Age Weekly*, 9 January, 1922.

**COLOURED LIGHTS TO GUIDE PILOTS BY NIGHT.**—The progress made by British civil aviation is emphasized in the half-yearly report issued by the Air Ministry on Friday.

Arrangements are being completed for opening the Croydon-Lympne air route for night flying, the machines to be guided by a chain of aerial lighthouses, pilotage and coloured lights.

The number of passengers carried was 31,853. Imports by air totalled £206,357, and exports £110,400.

Wireless apparatus will be made compulsory for all machines carrying ten or more passengers, with a view to minimizing risks from fogs, etc., states the report, which concludes by predicting a chain of inter-Imperial air communication lines.—*Naval and Military Record*, 28 December, 1921.

**FOKKER ACHIEVEMENT.**—According to London newspapers, Fokker, the famous Dutch aeroplane designer, who gave his name to the German fighting aeroplanes, has now invented and built a motorless aeroplane which can be towed behind an air express and "slipped" when over an intermediate air station. A pilot sits in the "aerial trailer," and after it is "slipped" by the engined air express, will guide it down to land. Thus it will be possible, it is said, for an air express on a journey from London to Brussels to drop passengers at Ostend without landing there, as a railway express train drops "slip coaches."—*Aerial Age Weekly*, 30 January, 1922.

**AMERICAN FIRM ORDERS OCEAN-FLIGHT PLANE.**—An American firm has just ordered an aeroplane of the type described by Louis Breuget, a famous French flier and constructor, as "an ocean-crossing plane." M. Breuget recently predicted that these aeroplanes will be making frequent trips across the Atlantic within two or three years. They are now under construction.

They are expected to be able to fly twenty-four hours without stopping, at a speed of 180 miles an hour, and to carry twenty or thirty passengers, with baggage. This would bring the two continents within a day's travel of each other.

The planes are being planned with huge wings, six feet thick, the interior of which will be used for cabins. As described by M. Breuget, their total weight will be 155 tons, their wing-spread 375 feet, and they will have twenty-four motors of 500 horsepower each.

"There is no reason why an aeroplane could not make the circuit of the world without a stop, if we pursued the formula as to weight-lifting and speed and if greater room can be found for fuel, say seventy per cent. of the total lifting power," says M. Breuget. "Such a plane would travel at a speed of 750 miles an hour, but this speed would be impossible unless an average height of 42,000 feet could be maintained. At such a height the atmosphere has one-fifth of its ordinary density.

"The vista spread out by such a possibility is amazing. Man could fly around the earth faster than the earth's movement. He could, so to

speak, catch up with the sun. New York would only be six hours from Europe. Again, in the case of war, what would be the use of big fleets if they were faced with huge 100 and 200 ton aerial torpedo planes? The navies of the world will then be relics of the past, fit only for a place in a museum next, let us say, to mammoths.

"People laugh at these predictions," ended M. Breuget, "but so did people in 1840 when steam navigation was introduced."—*Aerial Age Weekly*, 16 January, 1922.

**MARTIN BOMBER MAKES RECORD.**—Equipped with superchargers and with Lieutenant Willard S. Wade as pilot, the latest Martin bomber type of ship on December 7 climbed to an altitude of 21,000 feet, carrying four passengers but no bomb load. Due to a lack of oxygen the observer was overcome.

On December 8 the Martin bomber, equipped with superchargers and with Lieutenant Wade as pilot, climbed to an altitude of 25,600 feet until the gasoline supply was exhausted. In switching the gasoline tank to the emergency, it was found that the latter was frozen so it was necessary to discontinue the climb. The personnel, however, suffered no ill effects as there was a sufficient supply of oxygen. It is estimated that the ship can go to approximately 28,000 feet.

The authorities at McCook Field, Dayton, Ohio, from which these tests have been conducted, believe that the results which have been obtained are of the greatest importance in connection with the future of bombing airplanes. The record made on December 7, it is believed, is a world's altitude record for two-motored airplanes.—*Army and Navy Journal*, 24 December 1921.

**BRITISH AIR MINISTRY TO OFFER £50,000 FOR A PRACTICAL HELICOPTER AEROPLANE.**—Subject to Treasury sanction, the British Air Ministry proposes to offer a prize of £50,000 for a practical helicopter-designed aeroplane; that is, an aeroplane capable of rising vertically over a given spot.

Following are among the conditions to be observed by the competing designers: The machines must be capable of rising to a height of 2,000 feet under their own power, carrying one man and one hour's fuel supply; able to remain stationary over a ground object for half an hour in any wind up to twenty miles an hour; able to land safely in any wind up to twenty miles an hour without horizontal motion and with the engine cut off; able to maintain a horizontal flight at a height of 2,000 feet at a speed of not less than sixty miles an hour.

Foreign as well as British inventors will be invited to take part in the competition.

Some months ago, it is stated, experiments with the helicopter were to take place at Farnborough with a British inventor's machine. Great secrecy was observed by the Air Ministry in regard to the tests.

According to reports received in London last April, a successful flight with a helicopter had been made abroad. This machine was invented by Lieutenant von Petroczy of the Austrian Army Balloon Corps.—*Aerial Age Weekly*, 9 January, 1922.

**SINGLE VS. MULTIPLE ENGINES.**—It is commonly thought that safety and reliability are necessarily increased by increasing the number of engines. As a matter of fact the multiple engine plane has its disadvantages as well as its advantages, both of which may be quite definitely figured. For example, comparing a typical two-engine airplane with two single-engine ones, other things being equal, the former has the following advantages:

- (1) It has half the liability to complete engine failure of either of the two single engine planes (neglecting fuel connections, etc., that may be common to both).
- (2) It is slightly cheaper than the two small planes.
- (3) It will carry slightly more, up to a certain size.
- (4) For short trips the operating personnel would be cut down.

But, at the same time, the two-engine airplane has the following disadvantages:

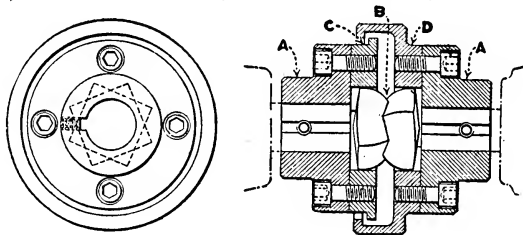
- (1) It is twice as liable to engine trouble as either of the small planes.
- (2) The danger arising from engine stoppage near the ground is probably greater due to the unbalanced thrust of the remaining propeller.
- (3) The large plane must bear the expense of a full load even when the actual load carried is less than half.
- (4) The difficulty of making an emergency landing is fully 50 per cent greater than for one of the small planes.

After all is said, the inherent advantages favoring any particular number of engines make but a small balance in either direction. This leaves as the main factor for consideration the fundamental one of choosing a design best fitted for the requirements of the particular service in view.—*Aviation*, 2 January, 1922.

### ENGINEERING

**WHITNEY FREE-FLOATING COUPLING.**—With the general design of flexible couplings it is necessary, in the instance of motor or turbine-driven pumps or generators, practically to disassemble both units in order to remove one or the other from its casing. This is not necessary with the Whitney free-floating coupling, as because of its design the coupling element can be removed from the coupling without disturbing either the driving or the driven unit.

This coupling, which is made by the Kay Manufacturing Co., Norwalk, Conn., consists of two hubs *A*, a link *B*, an inner ring *C* and an outer



END AND SECTIONAL VIEW OF COUPLING

ring *D*. Both the inner and outer rings are secured to the two hubs by capscrews, the heads of which are in countersunk holes in the hubs. Clearance between the inner and outer rings permits the coupling to adjust itself to any misalignment of the shafts.

After the capscrews have been removed the rings *C* and *D*, together with the link *B*, can be taken out without disturbing the hubs *A* and *B*, after which either the driving or driven element can be removed from its casing, or the unit as a whole can be taken from its base without disturbing the other unit.—*Power*, 31 January, 1922.

**A HIGH-SPEED CRANKLESS STEAM ENGINE.**—Mr. A. G. M. Mitchell, the inventor of the "Michell-block," which has had a world-wide success, and has revolutionized practice in high-pressure bearings, has recently completed tests of a new type of steam engine. There have been many attempts to construct a crankless reciprocating steam engine, but none of these has achieved any great measure of success. In the latest type, however, advantage has been taken of the new principles upon which the Michell thrust-block is founded, with every appearance of practical success.

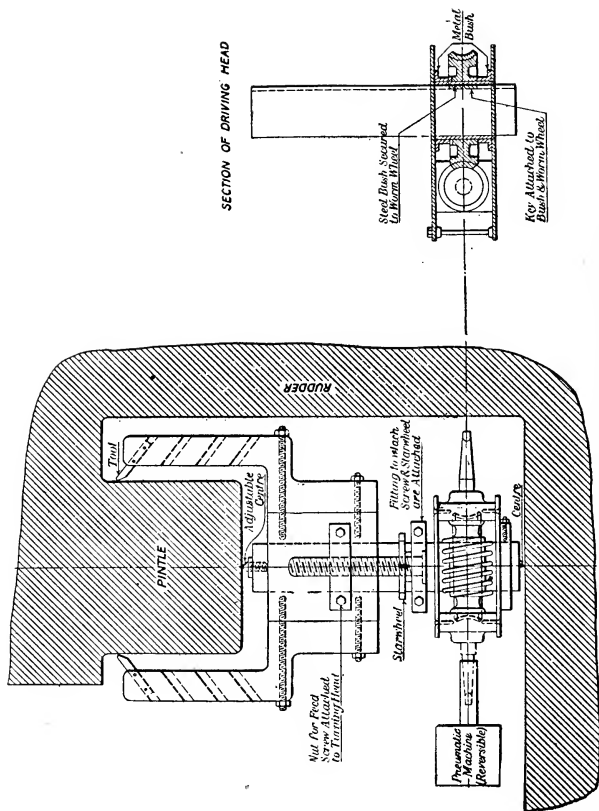
The engine is enclosed in a cylindrical casing, and the rotating shaft is co-axial with this casing. The cylinders are in two sets of four, arranged round the shaft with their axes parallel to it. Instead of crank-shafts there is a swash-plate, i.e., a plate with its plane inclined to the shaft-axis; the angle of inclination of the swash-plate in the test engine is  $62\frac{1}{2}$  degrees, but in later engines this will be increased to  $67\frac{1}{2}$  degrees. As the shaft rotates it will be seen that the surface of the swash-plate will alternately approach and recede from each of the cylinders in turn. Pistons in the cylinders, bearing upon the plate through spherical bearings and Michell pads, are thereby given a reciprocating motion. Opposing pistons are connected rigidly by a bar crossing the outside of the swash-plate. The engine is uniflow, steam acting on one side of the pistons only. It is admitted to the cylinders by two rotating disk valves, one at each end of the casing, and exhausts at the end of the stroke. Very perfect balance is assured, and the designed speed of 1200 r.p.m. is largely exceeded. The cylinders are 5 inches in diameter, and the engine develops about 90 horsepower at 1200 revolutions. It may be mentioned that the coefficient of friction at the Michell pads, where the pistons bear on the swash-plate, is about 0.002. The whole engine owes its success to this very low value. It may be that an engine of this general design may ultimately be used for aircraft power plant, because of low weight.—*Scientific American*, February, 1922.

**RE-TURNING A RUDDER PINTLE IN DRY DOCK.**—The task of turning up a rudder pintle which has become worn as a result of long service generally involves the removal of the rudder and taking it to a well-equipped repair shop.

That it is not impossible to do the job in dry dock is shown by the accompanying drawing, which illustrates a very ingenious but simple machine whereby a pintle which had worn approximately .200ths out of truth was returned; the only source of power required was an ordinary pneumatic drill provided with a reversing motion.

The rudder was lifted and placed in the bottom of the dry dock, the temporary cutting machine being arranged below the pintle center as shown in the diagram. A shaft provided with an adjustable center and carrying at the bottom a worm wheel is mounted between the center of the pintle and the body of the rudder. This shaft is driven by a worm which fits into the driving head of the pneumatic machine in the same way as the ordinary Morse taper drill. Secured to the shaft is the turning head which, while rotating with the shaft, is free to slide up or down on a feather key. The feed mechanism consists of an ordinary nut bolted on the turning head in which is a screw, the bottom of the screw being secured to a bracket on the shaft mounted just above the worm wheel.

The feed of the tool is obtained by means of a star-wheel as shown. Since, however, there is only room to give a very small travel of the turning head, this is provided with four grooves to take the cutting tool, the distance between each groove being slightly less than the maximum travel of the turning head.



SECTION OF DRIVING HEAD

DIAGRAM SHOWING ARRANGEMENT OF MACHINE FOR TURNING RUDDER  
PINTLE IN DRY DOCK



As soon as the cut has been taken with the tool in, say, the lowest groove, the turning head is brought back to its lowest position and the tool inserted in the next groove. The process is then repeated until a cut is taken for the entire length of the pintle.

It was found that the apparatus worked very well, making a very true and smooth job.—*The Marine Engineer and Naval Architect*, January, 1922.

### NAVIGATION AND RADIO

**RADIO SHIP CONTROL**, by Rear Admiral R. S. Griffin, U. S. N. Retired. —The bombing tests which were carried out last summer against the old battleship *Iowa* (now designated Coast Battleship No. 4), during which that ship was operated and maneuvered under her own power without the presence on board of any of her officers or crew, created so much public interest that it has been suggested that a description of the mechanical changes that were made in her power equipment would be of interest to the members of The American Society of Mechanical Engineers.

The *Iowa* is a ship 360 ft. long on the waterline, of 72.2 ft. beam, and at a draft of water of 24 ft. has a displacement of 11,346 tons. She has twin-screw vertical triple-expansion engines of 11,800 indicated horsepower which are capable of giving her a speed of 17-knots. They are, of course, condensing.

The problem presented was so to modify her power plant that the ship would be susceptible of control by radio energy from another ship, both as to speed and direction, without any person being on board; that under this condition she should be capable of steaming for at least two hours at a speed of about 10 knots; and that means should be provided for automatically stopping the engines and shutting off the oil supply to the boilers after fifteen minutes of operation following a failure of the radio control.

The first part of the problem obviously pointed to an oil equipment as the only one that could be considered, and as the *Iowa* was a coal-burning ship it became necessary to transform some of her boilers to oil-burning. The speed requirement of 10 knots necessitated the development of but a small fraction of full power, and therefore it was necessary to convert only one-half her boilers for steaming at a very moderate rate of combustion.

The boilers are of the Scotch or return fire-tube type, and therefore are not so well adapted to oil burning as are water-tube boilers. However, for the power that had to be developed, this presented no difficulty. The lining with firebrick of the combustion chambers and the front end of the furnaces, and the protection of the joint of furnace and combustion-chamber sheet were the only alterations that were necessary to the fire side of the boilers. Alterations to the furnace fronts were, of course, necessary to accommodate the oil burners. All these alterations are indicated in Fig. 1.

Fuel-oil pumps were installed and were equipped with stop valves in their steam lines such that these valves could be instantly closed by radio signal if it were desired to stop the engines, or automatically in case of low water in the boilers.

In order to maintain a uniform water level, it was necessary to install feedwater regulators, which controlled the speed of the feed pumps in the usual manner.

The storage of fuel necessary to provide the continuous steaming laid down in the problem was easily effected by utilizing a few of the double-bottom compartments.

The only alterations that were necessary to the engines were certain modifications of the throttles to permit of radio control. The type of engines made it necessary to design for the condition in which the engines

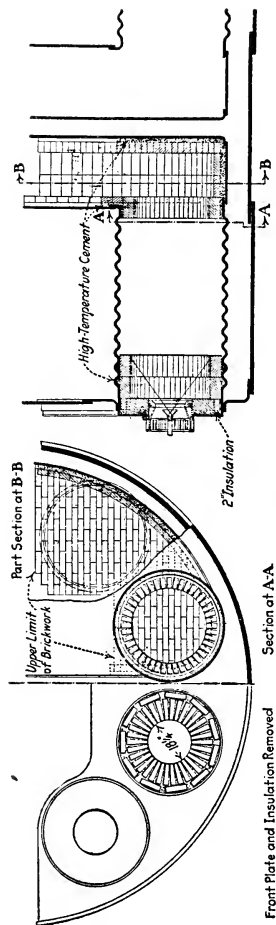


FIG. 1—ALTERATIONS IN SCOTCH MARINE BOILER TO ADAPT IT TO OIL BURNING

would be just turning over before the crew abandoned the ship, the function of the radio control then being to open the throttle to the extent necessary to secure the desired speed—which had been determined by test—and also to stop the engines should it be necessary so to do. The control was so effective that no difficulty whatever was experienced in controlling the speed, slowing down being accomplished in twenty seconds and increase to full speed in three minutes.

Such auxiliaries as air pumps, circulating pumps and bilge pumps, the operation of which at normal speed would have no material influence on either the speed of the engines or the boiler conditions, were unaffected by the conditions of the problem and were untouched after once having been set at the proper speed of operation.

The points that have thus far been mentioned pertain solely to the propulsion of the ship. In order to maneuver her, which was one of the most important considerations in connection with the bombing tests, it was necessary that the steam steering engine be under as complete radio control as the main engines. Ordinarily this is accomplished through wire-rope transmission from the steering wheel on the bridge to the shaft which operates the engine-control valve. For this test a small motor was installed and connected by chain drive to the control-valve shaft. It was provided with an automatic reversing contactor controller which was operated through the radio-control panel or automatically through the gyro clutch. It proved to be an admirable substitute for the hand steering wheel.

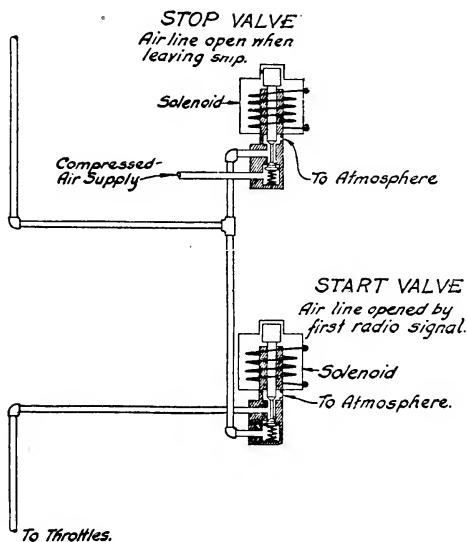


FIG. 2—RADIO-CONTROL VALVES FOR OPENING AND CLOSING THROTTLE-CONTROL VALVE, FIG. 3

Naturally, considerable electric energy would be necessary to operate the various radio circuits and apparatus, but as operation of the ship's electric plant during the test would unnecessarily complicate the problem without supplying any useful information respecting the results which it was desired to accomplish, it was decided to provide storage batteries and control panels for the several circuits.

In preparation for radio control the oil-fuel pumps, the air and circulating pumps, the feed pumps, an air compressor and a bilge pump are put in operation, and the steering engine warmed up and operated by hand control. When normal conditions are established, the main engines are started and kept running at dead-slow speed, the bridge control of steering engine thrown out, all batteries connected to bus bars, and switches to radio-control instruments and gyro compass, and steering-engine motor thrown in. Everything is now in readiness for radio control and the signal given to "abandon ship." As soon as the boats that take off the crew are clear of the ship, she is immediately put under radio control by the control ship, which in this case was the battleship *Ohio*, which during the past two years has rendered excellent service in radio engineering experimental work under the Bureau of Engineering of the Navy Department.

The method of control will be understood from the following:

When the air compressor is started, pressure is brought up to the "stop valve," Fig. 2, which may be called the master radio-control valve. This

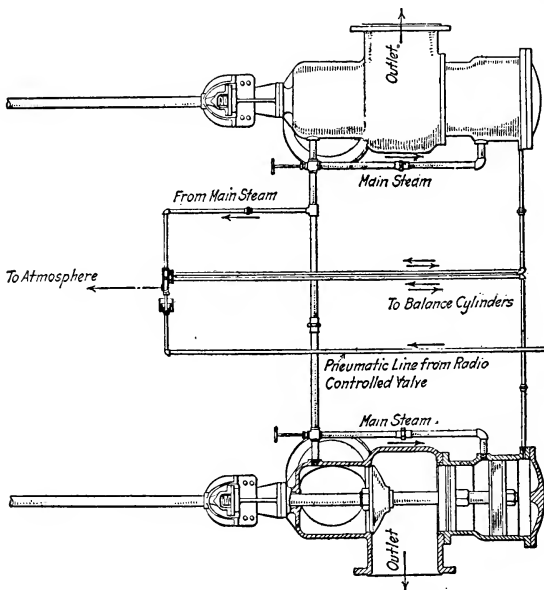


FIG. 3—DIAGRAMMATIC ARRANGEMENT OF QUICK-CLOSING MAIN ENGINE THROTTLE VALVES AND CONTROL VALVES

valve is then energized from the ship's control room, by which action air is admitted to the balance cylinder of a quick-closing valve in the steam line to the fuel-oil pump and up to the "start valve," as indicated in the sketch. The first signal from the control ship energizes the "start valve," Fig. 2, which admits air to the piston of the throttle-control valve shown in Fig. 3. This throws the piston to the left, shuts off steam from the upper balance pistons, and the throttles open to the extent necessary for the desired speed, the lower balance piston being smaller in diameter than the upper one.

The opening by the control ship of the radio circuit to "start valve" closes the valve to air pressure under the action of the spring, and the pressure in the line to throttle-control valve is released. When this occurs, the piston valve is thrown far enough to the right to uncover the port to the steam pipes leading to the upper chambers of the balance cylinders and the throttles close under the action of the steam pressure.

Similar action takes place when it is desired to stop the fuel-oil pump. The proper opening of the steam valve to this pump having been pre-

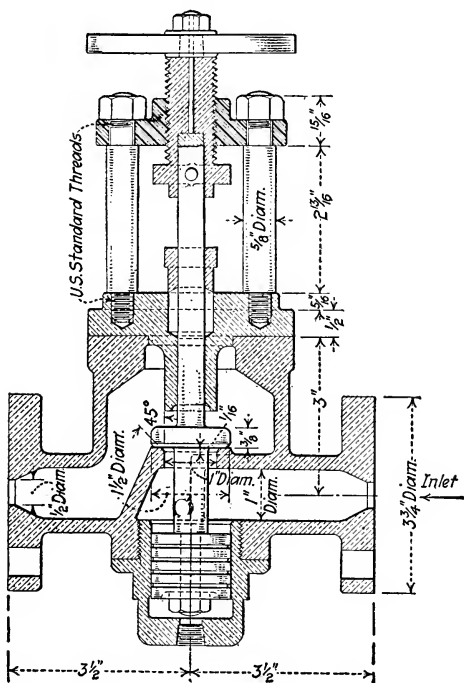


FIG. 4

vously determined and air pressure being on its balance piston, a radio signal releases the air pressure, whereupon the valve closes automatically under the influence of steam pressure on the other side of the balance piston. The throttles close at the same time. Fig. 4 shows the type of valve used.

The requirement that the engines and the fuel-oil pumps should stop automatically after a certain lapse of time in case radio control failed was accomplished by the introduction of a "time limit clock" in the "stop valve" circuit. After the lapse of time for which it had been set, the clock opened this circuit, and the steam valves to the oil pumps and the engine throttles closed in the manner previously described.

The low-water alarm was of the usual type except that, instead of blowing a whistle, the steam was used to operate a piston that opened the "stop valve" circuit.

The principal radio-control apparatus is covered by patents of John Hays Hammond, Jr., who permitted the free use of it for this test. It was constructed by the General Electric Company under the supervision of Mr. Hammond and the Bureau of Engineering. Its success was pronounced from the start, but as with the first tests of all such apparatus, it was found that some of the parts were too sensitive, and more rugged ones were developed under the direction of the officers of the Battleship *Ohio*. Simplification of the equipment was also effected in the same manner.—*Mechanical Engineering*, January, 1922.

**RADIO IN THE FUTURE.**—Few people realize the future of radio in all aviation activities. The block signal system which has been developed at so much expense of time and money for the railroads, has no counterpart in the air.

Wireless apparatus will have to take care of all this work in addition to ordinary commercial telephone communication from plane to ground and vice versa. That is to say, a plane in commercial use will be using its wireless apparatus practically all the time when commercial air transportation is fully established. At the present development of the art, this is nearly impossible due to the interference brought into play. Some new invention or development is clearly required in this connection.

Two methods immediately suggest themselves. One would be some form of multiplex apparatus, and the other, directed messages. The first is self explanatory. By the second we mean that the messages being sent out along a certain airway would be directed along that airway and hence would not interfere with other traffic. The method of restricting wave lengths for certain classes of work has nearly reached its limit of usefulness today.

It is hoped that this problem will be solved before the situation becomes really acute.—*Aviation*, 23 January, 1922.

**WIRELESS TELEGRAPHY IN SWEDEN.**—The first Swedish wireless telegraph station for navigation was officially opened at Vinga, off Gothenburg, on November 15, states H. M. Minister at Stockholm, who adds that three other similar stations are being planned. The wireless station is intended to facilitate the navigation of vessels calling at the pilot station off Gothenburg, and of all vessels in the Skagerrack passing Skagen. It has a radius of over 100 nautical miles. The wireless reports from Vinga will be transmitted free of charge for the present. The Swedish Government has recently approved proposals made by the Swedish Pilotage Board for co-operation between countries on the North Sea and the Baltic in regard to ice signalling by wireless. According to press reports in Sweden, the proposals to which effect was to be given at the close of

November, comprise a scheme for reports covering the entire Swedish coast from Haparanda to the Norwegian frontier. These wireless reports regarding the condition of the ice were to be issued daily in cypher, the key to which is being published in the Swedish Notices to Mariners. The wireless messages are also to include information regarding wrecks, the withdrawal of lightships, and with regard to the presence of obstacles to navigation.—*Engineering*, 23 December, 1922.

LONG DISTANCE WIRELESS IS STILL UNEXPLAINED.—In a lecture on the coming of age of long distance wireless telegraphy delivered at the Royal Society of Arts, Professor J. A. Fleming said that the length of waves mostly used for long-distance radio work is between six and twelve miles. Many eminent mathematicians have proven, however, during the last twenty years, that the signals received at distances of 6,000 to 12,000 miles are millions of times stronger than can be accounted for by pure diffraction or bending of the waves round the earth.

It is now generally agreed that long distance wireless telegraphy is only made possible by the existence of an electrical conducting layer in the earth's atmosphere at a height probably of from 100 to 200 kilometers. The presence of this highly conductive layer in the upper regions of the atmosphere, the component gases of which are hydrogen and helium, is probably due to electrified dust which comes to us from the sun being powerfully repelled against the attraction of gravitation by the pressure due to waves of light. This dust comes from the sun with enormous velocity and enters the higher levels of the atmosphere thereby rendering the same an electric conductor. The conducting layer guides the radio waves round the earth and prevents them escaping into space. No satisfactory explanation can yet be given as to the nature of the waves used in wireless telegraphy.—*Nautical Gazette*, 7 January, 1922.

### ORDNANCE

ARMOR PIERCING TESTS.—During the past month tests have been conducted by the Ordnance Department at the Aberdeen Proving Ground, Md., of new types of .30 caliber armor piercing ammunition. Three types of bullets were tested, two of which have been in use for several years, namely, the .30 caliber armor piercing ammunition, Model of 1917, and the standard ammunition for testing light armor plate. The third type is a rather long bullet with hardened steel core, having a sharp ogive conforming in general to the ogive of the Service ammunition. While this bullet showed some remarkable features, it was found that the long point was not entirely satisfactory. In consequence of this it is expected that development will be continued and that eventually a new type of armor piercing ammunition will be evolved which will be superior to anything that has heretofore been available.—*Army and Navy Journal*, 24 December, 1921.

### MISCELLANEOUS

SHIPBUILDING IN MINOR NAVIES.—Italian yards have been working on the balance of the war programme, which includes three "scouts," of 2200 tons, fourteen destroyers of 800 to 900 tons, and seven gunboats. In February last a new naval bill was introduced and passed, providing for the construction of two light cruisers, each of 5000 tons; four 900-ton destroyers, four 600-ton submarines, eight small minelayers and supply ships, an oil tanker of 7000 tons, and several armed motor launches. So far as is known, all these vessels are still in the designing stage. The battleship *Leonardo da Vinci*, whose salvage last year constituted one of the most remarkable engineering feats of its kind ever achieved, is not

to be reconditioned as a warship. There is some talk of converting her into an oil tanker.

The Spanish battleship *Jaime I.*, which was laid down as long ago as 1912, ran her steam trials last May. Except for the armament, the vessel was completed and her machinery tested in May, 1915, but owing to the war it was impossible to secure delivery of the heavy guns and mountings from the manufacturers—Vickers Limited and Sir W. G. Armstrong, Whitworth and Co., Limited. The two sister ships, *España* and *Alfonso XIII.*, have been in service six years. All three vessels are uniform in dimensions, etc., displacing 15,452 tons; maximum speed, 19½ knots; main armament, eight 12-in. 50-calibre guns. The whole of the machinery was manufactured at the Ferrol works of La Sociedad Española de Construcción Naval, where the ships were built. The steam trails of the *Jaime I.*, were very satisfactory, a mean speed of 20.028 knots being obtained in four runs over the measured mile. Work is proceeding at the Ferrol yard on two light cruisers—one said to be named *Almirante Cervera*—of 4725 tons and 29 knots speed, while the Cartagena yard has in hand three large destroyers and six submarines.

A naval programme for the defence of the Homeland and the Colonies was introduced by the Netherlands Government last November. It is limited to destroyers, submarines and aircraft, and, in view of the financial position, is to be spread over a period of six years. The light cruiser *Sumatra* was launched at Amsterdam on the penultimate day of 1920, but her sister ship, the *Java*, is still on the stocks at Flushing. The *Celebes*, a third vessel of this type, has been cancelled. The *Sumatra* and *Java* are vessels of 7050 tons, 30 knots speed and an armament of ten 5.9 in. Krupp guns. A number of submarines are in hand. In January last it was reported from Berlin that the Netherlands Government had placed an order with the German firm of Thiess for eighteen submarine engines, six of 450 horse-power and twelve of 1200 horse-power, the boats for which were to be built in Dutch yards.

There is scarcely any new construction in progress for the Scandinavian navies. Sweden has completed the *Gustav V.*, third of the *Sverige* class of small coast-defence battleships; Norway is building two submarines, and has ordered two more from the United States; and Denmark has decided to transform the uncompleted monitor, *Niels Juel*, into a cruiser, with a quick-firing armament. This vessel was to have carried two 12-in. guns.

Various naval projects are under consideration in the South American States, but nothing definite has emerged up to now. It is to be apprehended that the clause in the Washington agreement which forbids the signatory Powers to sell existing warships to other States or construct new vessels for foreign account will not only hamper the development of minor navies, but deprive British shipbuilders of a class of business which has proved lucrative to them and highly satisfactory to their foreign customers.—*The Engineer*, 13 January, 1922.

EFFECT OF GOVERNMENT SUBSIDIES.—Italy furnishes a proof of how subsidies retard the rejuvenation of a nation's merchant marine. As a rule ships 20 years afloat are considered to have about outlived their usefulness and certain authorities have even urged the destruction of all liner tonnage reaching this age. Yet in the case of the 85 vessels subsidized by the Italian Government to the amount of 100,000,000 lire, the average age is 27 years. Only 27 of these ships are 20 years old or less, while 25 have been in service for more than 30 years. Eight steamers have passed the half century mark, the 3 oldest having each survived the storms of 59 wintry seas. Had they not been the recipient of Government



doles, it is safe to say that these veteran craft would have long since been replaced by vessels of a modern type.—*Nautical Gazette*, 21 January, 1922.

**THE YANGTSE PATROL.**—A very interesting report has appeared in the Japanese papers apropos the policing of the Yangtse. It is to the effect that, in view of the disturbed state of things prevailing along the river, the Powers whose interests are at stake have agreed upon conjoint measures to be taken for their protection. It has therefore been decided that a combined flotilla shall be organized, consisting of four British, six Japanese, four American, and two French warships. This force will be placed under the supreme command of Vice-Admiral Sir A. L. Duff, of the British China squadron, with Vice-Admiral Yoshida, commanding the Japanese squadron in Chinese waters, as second in command. The sphere of its activity will be the area covering Shanghai, Hankow, and Ichang. In accordance with this programme many warships of different nationalities were gathering at Shanghai when the despatch was sent. The details of organization and the allotment of special areas of protection were to be fixed on the arrival of all the ships participating.

The journal, *Asahi*, quotes a Japanese naval authority as saying that the scheme was first mooted by the British Minister at a conference of diplomats, which was called during the attack on Ichang by the Sechuan troops some time ago. The idea is considered difficult to operate in practice. Nevertheless, the situation along the Yangtse has become very grave, and it is not surprising that the scheme should be revived at this juncture. Indeed, a similar proposal was put forward at the time of the first Chinese revolution. There are now fifteen British gunboats in China, most of them grouped under Rear Admiral C. Maclachlan, as senior naval officer, Yangtse, with his flag in the Bee. It would seem therefore, that the above report is erroneous in naming the British contribution to the proposed international flotilla as four ships only, since all, or nearly all, our gunboats in China would probably join the force.—*Naval and Military Record*, 28 December, 1921.

**PETROGRAD PORT CONDITIONS.**—A Hamburg correspondent writes that a Norwegian captain, who has just returned from Petrograd, gives an interesting account of the chaotic conditions prevailing at that port and of the difficulty encountered in getting vessels unloaded. In the case of his particular ship, the discharging of cargo was begun on a Saturday. As the following Monday was a holiday no work was done on that day. On Tuesday a heavy snowstorm prevented the ship from being unloaded. On Wednesday one gang of laborers worked for one hour only.

After that better progress was made, but there was a continual shortage of workers, some of whom had to come great distances in order to reach their place of work. Winter had set in early and the cold hindered the work of unloading considerably. Both men and women workers were employed, who received no money for their labor but were given a certain amount of bread instead. They were thus without any incentive to speed up their labors. At the end of every hour work was halted for a short time, which period was called "smoking time." The laborers worked from 10 A. M. to 3 P. M. which five hours constituted a full day's work.

The entire harbor district is patrolled and watched by armed guards who allow no one except the workers admittance. On going ashore these as well as members of the crew are carefully searched. The seat of the Soviet Administration office is in a large building just outside the harbor district. It contains a large number of offices and some 300 clerks are employed therein. The utmost disorder prevailed everywhere and the

establishment was without any efficient head, for it is a rule of the Soviet Government that everything must be run by a commission instead of by a single individual. All of the rooms are unheated, poorly supplied with water facilities and badly lighted.

The captains of the ships which happened to be in port had to call every day at this administration building and to make a formal request for the unloading of their ships. Profuse promises were always forthcoming that the cargoes would be promptly unloaded, but little was done to make these promises effective. In one case a ship had been twenty-six days in port without its cargo having been touched.—*Nautical Gazette*, 7 January, 1922.

#### CURRENT NAVAL AND PROFESSIONAL PAPERS

Functions of the Submarine. *Naval and Military Record*, 18 January, 1922.

Design and Construction of U. S. Passenger Steamers. *Engineering*, 23 December, 1921.

Proportioning of Steam Turbine Blading. *Engineering*, 13 January, 1922.

Compounding the Combustion Engine. *Mechanical Engineering*, January, 1922.

The Machinery of Floating Docks. *The Shipbuilder*, January, 1922.

Printing Telegraph by Radio. *Journal of Franklin Institute*, January, 1922.

# NOTES ON INTERNATIONAL AFFAIRS

FROM JANUARY 5 TO FEBRUARY 5

PREPARED BY

ALLAN WESTCOTT, Professor, U. S. Naval Academy

## NAVAL AGREEMENTS

**FIVE-POWER NAVAL TREATY.**—In addition to the Four-Power Pacific Treaty, which was signed on December 13, the Washington Conference in plenary session on February 1 adopted the Five-Power Naval Treaty, fixing the ratio and amount of capital ship tonnage for the United States, Great Britain, Japan, France, and Italy for the next ten years; limiting the tonnage of aircraft carriers; specifying that cruisers shall not exceed 10,000 tons or carry above 8-inch guns; and limiting the construction of naval bases in the Pacific. Article XIX regarding Pacific fortifications, the only matter that remained unsettled during the final month of the Conference, was finally determined by listing the islands and territories to which the *status quo* should apply, the United States agreeing not to fortify the Aleutian Islands, and Japan making the same agreement for Formosa, the Pescadores, and other of her island possessions, as follows:

### Article XIX:

The United States of America, the British Empire, and Japan agree that the *status quo* at the time of the signing of the present treaty, with regard to fortifications and naval bases, shall be maintained in their respective territories and possessions specified hereunder:

(1) The insular possessions which the United States now holds or may hereafter acquire in the Pacific Ocean, except (a) those adjacent to the coast of the United States, Alaska, and the Panama canal zone, not including the Aleutian Islands, and (b) the Hawaiian Islands.

(2) Hongkong and the insular possessions which the British Empire now holds or may hereafter acquire in the Pacific Ocean, east of the meridian of 110 degrees east longitude, except (a) those adjacent to the coast of Canada, (b) the Commonwealth of Australia and its territories, and (c) New Zealand.

(3) The following insular territories and possessions of Japan in the Pacific Ocean, to wit: the Kurile Islands, the Bonin Islands, Amami-Oshima, the Loochoo Islands, Formosa and the Pescadores, and any insular territories or possession in the Pacific Ocean which Japan may hereafter acquire.

The maintenance of the *status quo* under the foregoing provisions implies that no new fortifications or naval bases shall be established in territories and possessions specified; that no measures shall be taken to increase the existing naval facilities for the repair and maintenance of naval forces, and that no increase shall be made in the coast defenses of the territories and possessions above specified. The restriction, how-

ever, does not preclude such repair and replacement of worn-out weapons and equipment as is customary in naval and military establishments in time of peace.

**SUBMARINE AND GAS AGREEMENT.**—To the Five-Power Treaty, adopted on February 1, binding the signatories to refrain from the use of submarines as commerce destroyers (for text see Notes in February issue), the following clause was added binding the signatories to refrain from use of poisonous gases in war between themselves:

The use in war of asphyxiating, poisonous or other gases, and all analogous liquids, materials or devices having justly been condemned by the public opinion of the civilized world and a prohibition of such use having been declared in treaties to which a majority of the civilized powers are parties, the signatory powers, to the end that this prohibition shall be universally accepted as a part of international law binding alike the conscience and practice of nations, declare their assent to such prohibition, agree to be bound thereby as between themselves, and invite all other civilized nations to adhere thereto.

**JAPANESE HOMELAND EXCLUDED.**—By a resolution adopted February 4 the Japanese homeland was excluded from the Japanese "insular possessions" protected by the Four-Power Pacific Treaty. This was done at the instance of the Japanese Government following the misunderstanding of this phrase as it occurred in the original treaty.

### FAR EASTERN AGREEMENTS

**AGREEMENTS RELATING TO CHINA.**—Of the two treaties relating to China adopted at Washington on February 4, one dealt exclusively with the Chinese Tariff and provided for its increase to an effective 5% within four months, with provision for further increases and revision every four years.

The other and more important treaty included the four principles proposed by Elihu Root and the reaffirmation of the "open door," the first four of the nine articles reading as follows:

*Article 1.*—The contracting powers, other than China, agree:

1. To respect the sovereignty, the independence, and the territorial and administrative integrity of China.
2. To provide the fullest and most unembarrassed opportunity to China to develop and maintain for herself an effective and stable Government.
3. To use their influence for the purpose of effectually establishing and maintaining the principle of equal opportunity for the commerce and industry of all nations throughout the territory of China.
4. To refrain from taking advantage of conditions in China in order to seek special rights or privileges which would abridge the rights of subjects or citizens of friendly States, and from countenancing action inimical to the security of such States.

*Article 2.*—The contracting powers agree not to enter into any treaty, agreement, arrangement, or understanding, either with one another, or, individually or collectively, with any power or powers, which would infringe or impair the principles stated in Article 1.

*Article 3.*—With a view to applying more effectually the principles of the open door or equality of opportunity in China for the trade and industry of all nations, the contracting powers, other than China, agree they will not seek, nor support their respective nations in seeking:

(A) Any arrangement which might purport to establish in favor of their interests any general superiority of rights with respect to commercial or economic development in any designated region in China;

(B) Any such monopoly or preference as would deprive the nationals of any other power of the right of undertaking any legitimate trade or industry in China, or of participating with the Chinese Government, or with any local authority, in any category of public enterprise, or which by reason of its scope, duration or geographical extent is calculated to frustrate the practical application of the principle of equal opportunity.

It is understood that the foregoing stipulations of this article are not to be so construed as to prohibit the acquisition of such properties or rights as may be necessary to the conduct of a particular commercial, industrial or financial undertaking or to the encouragement of invention and research.

China undertakes to be guided by the principles stated in the foregoing stipulations of this article in dealing with applications for economic rights and privileges from Governments and nationals of all foreign countries, whether parties to the present treaty or not.

*Article 4.*—The contracting powers agree not to support any agreements by their respective nationals with each other, designed to create spheres of influence or to provide for the enjoyment of mutually exclusive opportunities in designated parts of Chinese territory.

**JAPAN SURRENDERS SHANTUNG.**—The Shantung Treaty, signed in Washington by Japan and China on February 4, brought about a practically complete surrender of the province to China. Japan agreed to withdraw troops, police, and gendarmes from Shantung as soon as possible, to turn over all former German public buildings and property upon compensation for improvements, and to give over the German cable, wireless station, and salt industry (with the right of Japan to purchase a part of the product annually). Regarding the Shantung (Tsingtau-Tsinanfu) Railway, which constituted the chief stumbling block, the arrangement is that China shall pay 53,406,141 gold marks in Treasury bonds, having a fifteen-year limit, with the privilege to China of full or part payment at any time after five years. Prior to complete redemption there is to be a Japanese traffic manager, subject to a Chinese managing director. The other railways are to be international enterprises on terms fixed by China. One iron mine and two coal mines are to be operated under Chinese direction with Japanese capital not exceeding 50%.

**FRANCE AND ENGLAND RETURN BASES.**—At the plenary session of February 1 Mr. Balfour gave an official promise that Great Britain would restore Wei-hai-wei to China. M. Sarraut also stated that France would return Kwangchow-wan on the Chinese coast near French Indo-China.

**TWENTY-ONE DEMANDS.**—The statements of Japan, China, and the United States regarding Japan's "Twenty-one Demands" were recorded. Japan stated that the seven demands in Group V would be abandoned.

and made other concessions. Since Group I of the demands are already cancelled by the return of Shantung, the difficulties arising from the original demands are at least considerably reduced. At the same time Japan refuses consideration of the treaties and privileges secured in Manchuria and elsewhere when this ultimatum was originally presented to China.

**JAPAN'S SIBERIAN PROMISE.**—The statement of Baron Shidehara relating to Siberia was also recorded. This statement entered into an account of the circumstances under which Japanese troops entered Siberia, and ended with a promise to withdraw them, though without specifying the time. The latter part of his statement follows:

The Japanese Government are now seriously considering plans which would justify them in carrying out their decision of the complete withdrawal of Japanese troops from the maritime province, with reasonable precaution for the security of Japanese residents and of the Korean frontier regions. It is for this purpose that negotiations were opened some time ago at Dairen between the Japanese representative and the agents of the China Government.

Those negotiations at Dairen are in no way intended to secure for Japan any right or advantage of an exclusive nature. They have been solely actuated by a desire to adjust some of the more pressing questions with which Japan is confronted in relation to Siberia. They have essentially in view the conclusion of provisional commercial arrangements, the removal of the existing menace to the security of Japan and to the lives and property of Japanese residents in Eastern Siberia, the provision of guarantees for the freedom of lawful undertakings in that region, and the prohibition of Bolshevist propaganda over the Siberian border. Should adequate provisions be arranged on the line indicated the Japanese Government will at once proceed to the complete withdrawal of Japanese troops from the maritime province.

The occupation of certain points in the Russian province of Sakhalin is wholly different, both in nature and in origin, from the stationing of troops in the maritime province. History affords few instances similar to the incident of 1920 at Nikolaievsk, where more than 700 Japanese, including women and children, as well as the duly recognized Japanese Consul and his family and his official staff, were cruelly tortured and massacred. No nation worthy of respect will possibly remain forbearing under such a strain of provocation. Nor was it possible for the Japanese Government to disregard the just popular indignation aroused in Japan by the incident. Under the actual condition of things, Japan found no alternative but to occupy, as a measure of reprisal, certain points in the Russian province of Sakhalin in which the outrage was committed pending the establishment in Russia of a responsible authority with whom she can communicate in order to obtain due satisfaction.

Nothing is further from the thought of the Japanese Government than to take advantage of the present helpless condition of Russia for prosecution of selfish designs. Japan recalls with deep gratitude and appreciation the brilliant rôle which Russia played in the interest of civilization during the earlier stage of the great war. The Japanese people have shown and will continue to show every sympathetic interest in the efforts of patriotic Russians as pointing to the unity and rehabilitation of their country. The military occupation of the Russian province of Sakhalin is only a temporary measure and will naturally come to an end as soon as a satisfactory settle-

ment of the question shall have been arranged with an orderly Russian Government.

In conclusion, the Japanese delegation is authorized to declare that it is the fixed and settled policy of Japan to respect the territorial integrity of Russia and to observe the principle of non-intervention in the internal affairs of the country, as well as the principle of equal opportunity for the commerce and industry of all nations in every part of the Russian possessions.

AGREEMENTS NOT IN TREATIES.—*Washington, Feb. 6 (Associated Press).*—As the agreements of the Conference finally shape up, nine of the resolutions, formally adopted, are left out of the series of treaties, delegation leaders explaining that they deal with subjects which relate to executive policy and do not require parliamentary ratification.

These resolutions, which are declared, nevertheless, to stand as binding agreements among the powers, provide for withdrawal of foreign post offices from China, establishment of a commission to investigate extra-territoriality in China, regulation of Chinese radio facilities, consideration of the question of withdrawing foreign troops from Chinese soil, unification of the Chinese railroads, publicity of all commitments affecting China, "better protection" for the Chinese Eastern Railway, a conference of the powers on rules of warfare, and a request on the part of the powers that China reduce her military forces.—*New York Times*, 7 February, 1922.

#### GREAT BRITAIN AND IRELAND

IRISH FREE STATE ESTABLISHED.—After prolonged and bitter debate the Irish Dail Eireann on the night of January 7 approved the Anglo-Irish Treaty by a vote of 64 to 57. De Valera thereupon resigned the presidency of the Irish Republic, and a motion to accomplish his re-election was defeated (60 to 58). The House of Commons for Southern Ireland, summoned for the purpose, ratified the treaty unanimously (De Valera's followers absent) on January 14, and a provisional government was set up. Arthur Griffith as president of the Dail Eireann did not actually enter this government, which was headed by Michael Collins as Minister of Finance. Until general elections are held the Dail Eireann still controls the country, the provisional government functioning by its consent to execute the treaty. The provisional government took control on January 16.

NEGOTIATIONS WITH ULSTER.—At a conference in London on January 20 the Ulster premier, Sir James Craig, and Michael Collins reached an agreement by which (1) the boundary question was to be negotiated by one representative each from Ulster and the Free State, without a third British member; (2) the Belfast boycott against Catholic workmen was to be discontinued; (3) united efforts were to be made to settle the railroad dispute. A subsequent meeting of the heads of the two governments at Dublin on February 2 revealed fundamental difficulties over the boundary question, the Ulster premier declaring that there could be no question of a large transfer of territory to the Free State, whereas Collins insisted that this had been promised by Premier Lloyd George. The stiff attitude of the southern leader was attributed in part to his need of re-

taining a majority of the Dail Eireann, representatives of which were to meet on February 28.

**BRITISH OFFERS TO EGYPT.**—It was announced on January 29 that Lord Allenby, British High Commissioner in Egypt, had been requested to return to London for consultation on the Egyptian situation. The British government reiterated its willingness to recognize the sovereignty of Egypt and the re-establishment of an Egyptian parliament and foreign ministry, on the following conditions:

They must have full and effective guarantees, first, that the imperial communications, to which Egypt is essential, are assured; second, that Great Britain retain both the right and power to afford that protection to the foreign communities in Egypt which the Governments of these peoples in the existing conditions look to her to supply; and, third, that Egypt is safeguarded against all foreign interference or aggression, direct or indirect.

### WAR SETTLEMENT PROBLEMS

**SUPREME COUNCIL AT CANNES.**—A conference of the British, French, and Italian premiers, with representatives of other nations, and Ambassador Harvey present in an advisory capacity for the United States, met at Cannes on January 6. The chief accomplishment of the conference was an agreement to issue a general invitation to all European nations and the United States to attend a conference for the economic reconstruction of Central and Eastern Europe. The subsequent fall of the Briand Ministry brought the Conference to an end on January 12.

**GERMAN REPARATIONS PROPOSALS.**—At the Cannes Conference it was tentatively agreed that German cash payments this year should be reduced from the 2,000,000,000 gold marks due to 750,000,000, and that there should be payments in kind amounting to 1,450,000,000 gold marks. When the Conference broke up without final action, the Reparations Commission called upon Germany to pay 31,000,000 marks every ten days pending a final settlement, and at the same time present a definite plan for financial reforms.

The German reply on January 27 made various statements and proposals which may be summarized as follows: (1) Reforms made or to be made, including increased postal and rail rates, a new banking law separating the Reichs bank from government control, check on paper money issues, reduction of expenses, so that the internal budget had been balanced while leaving nothing for reparations payments. (2) Taxation proposals, including a 1,000,000,000 gold mark compulsory loan to fall upon the capitalistic classes, details not arranged, but to bear no interest for three years and only a small rate thereafter. (3) Reduction of cash payments this year below the 720,000,000 gold marks demanded, with opportunity to increase payments in kind. (4) Appeal for restoration of the European economic system, enabling Germany to float a great international reparations loan.

This reply was not acted upon by the Reparations Commission but was transmitted to the Allied Governments.



**FIRST SESSION OF LEAGUE WORLD COURT.**—The first preliminary sitting of the Permanent International Court of Justice established by the League of Nations was held at the Peace Palace in The Hague on January 30. Dr. B. T. C. Loder of Holland took the chair and was afterward elected permanent president of the court for a term of three years. His salary is 15,000 florins with 40,000 allowances, and that of the other judges 15,000 with 20,000 allowances. The first public meeting of the court was scheduled for February 15, although there were no cases on the calendar. Eighteen nations have accepted compulsory jurisdiction of the court in disputes with other nations, and the court has also been given jurisdiction by the league over disputes relating to international labor and transit agreements, certain African treaties, and agreements regarding protection of minorities. The court meets at least once a year about June 15.

### FRANCE

**POINCARÉ SUCCEEDS BRIAND.**—After securing at Cannes certain modifications in the proposed Anglo-French Treaty, Premier Briand returned to Paris on January 12 to face the increasing opposition to his policies in the French Chamber. In spite of the fact that he rallied a majority of the deputies to his support, and without waiting for a vote, M. Briand with his cabinet then resigned. His resignation was attributed to his feeling that he could not continue foreign negotiations while constantly hampered and criticized in parliament.

Former President Poincaré, leader of the opposition, was asked to form a new cabinet, and on January 15 presented a slate composed almost entirely of members of the Right or Nationalist party. Of the thirteen members, five, including M. Sarraut, Minister of Colonies and then in Washington, had served under Briand. Indications were that the new premier would continue his predecessor's policies, the change being chiefly toward a stiffer attitude in maintenance of French interests. To this end, M. Poincaré expressed his intention to give up the Supreme Council, where France was often in a minority, as a means of settling international policies, and return to negotiations through ambassadors and the ordinary diplomatic channels.

### GENOA CONFERENCE

**CALL FOR GENOA CONFERENCE.**—On January 6 was issued the text of the Supreme Council resolution calling for a general economic conference of all European states, including Germany, Austria, Hungary, and Russia. The purpose was stated to be a common effort of the great powers for the rehabilitation of the European economic system and restoration of normal production and commerce. The announcement read in part:

The allied powers consider that the fundamental and indispensable conditions for the realization of an efficacious effort are capable of being defined in general terms as follows:

(1) The nations cannot claim the right to dictate to each other the principles according to which they must organize within their frontiers,

their régime of property, their economy and their government. It is the right of each country to choose for itself the system which it prefers.

(2) Nevertheless it is not possible to place foreign capital in order to help a country unless the foreigners who provide the capital have a certitude that their property and their rights will be respected and that the fruits of their enterprise will be assured.

(3) This feeling of security cannot be re-established unless nations or their Governments desiring to obtain foreign credits freely engage: (a) To recognize all public debts and obligations which have been contracted, or will be contracted or guaranteed by States, municipalities, or other public organizations, and to recognize also obligation to restore or, in case of default, to indemnify all foreign interests for loss or damage which has been caused by the confiscation or sequestration of property; (b) to establish legal and juristic punishment and assure the impartial execution of all commercial or other contracts.

(4) The nations ought to have available convenient means of exchange; in general, financial and monetary conditions ought to exist which offer sufficient guarantees.

(5) All nations ought to engage to abstain from all propaganda which is subversive of the political system established in other countries.

(6) All nations ought to take a common engagement to abstain from all aggression on their neighbors.

If with a view to assuring the necessary conditions for the development of the commerce of Russia the Russian Government claims official recognition, the allied Governments cannot accord this recognition unless the Russian Government accepts the preceding conditions.

AGENDA OF CONFERENCE.—*Paris, Jan. 19 (Associated Press).*—The program of the coming economic conference to be held in Genoa was officially made public tonight. The questions to be discussed will be:

(1) Examination into means for putting into execution the principles contained in the Cannes resolution of January 5, 1922.

(2) Establishment of European peace upon a solid basis.

(3) Conditions necessary to the restoration of economic confidence without endangering or altering existing treaties.

(4) Financial questions, such as currency, paper money, banks and banking systems.

(5) Economic and financial questions.

ACCEPTANCE OF CONFERENCE INVITATIONS.—The invitations to the Genoa Conference were at once accepted by all the European powers. From Moscow it was announced that Lenin would attend in person, with a large following. The United States delayed in replying, but it was considered certain that this country would decline to take an active part. Premier Poincaré indicated the continued willingness of France to participate, but only on condition that the scope of discussions should be strictly limited and defined beforehand. In view of this attitude, and various changes of ministries, a postponement or abandonment of the Conference appeared certain.

### PROJECTED ANGLO-FRENCH ALLIANCE

BRITISH PROPOSALS.—The British Memorandum for an Anglo-French treaty as presented on January 11 began with a statement of the need of assuring France against German aggressions and then laid down what were

practically the conditions essential to a treaty: (1) That England did not intend to be involved in military enterprises in Central and Eastern Europe; (2) That naval competition between France and England must be avoided, by conference or naval programs; (3) That agreement must be reached on a policy for restoring peace in the Near East. The treaty proposals followed:

*Article I.*—In case of direct and unprovoked aggression against the territory of France by Germany, Great Britain will place herself immediately at the side of France with her naval, military and aerial forces.

*Article II.*—The high contracting parties again affirm the common interest which Articles 42, 43 and 44 of the Treaty of Versailles have for them, and they will act in concert if there arises any menace of violation to any one of said articles, or if any doubt arises as to their interpretation.

*Article III.*—The high contracting parties also undertake to act in concert in case of Germany taking any military, naval or aerial measures whatever incompatible with the Treaty of Versailles.

*Article IV.*—The present treaty imposes no obligation whatsoever on any dominions of the British Empire, unless or until approved by the dominion which is interested.

*Article V.*—The present treaty will remain in vigor for a period of ten years, and will, by common accord, be renewable at the end of that period.

**FRENCH COUNTER-PROPOSALS.**—The Poincaré government, taking up the Anglo-French treaty negotiations, proposed (1) a duration of twenty-five years instead of ten; (2) specific mention of reciprocal aid, France promising assistance to England; (3) extension of "German aggression" to include violations in the neutral zone; (3) immediate discussions in case of menace to Poland; (4) making the treaty a definite military instrument by provision for co-operation on the part of the army and navy general staffs of the two nations.

To these proposals the British reply was in general unfavorable on the ground that Great Britain did not wish to enter upon a military combination to control Europe. Furthermore, agreement upon a Near Eastern policy was insisted upon.

**ALLIED PROBLEMS IN NEAR EAST.**—At the Cannes Conference French opposition to Briand was aroused by fear that he would throw over French ambitions in the Near East as the price of accord with England. A conference of British, French and Italian foreign ministers on the Near East set for February 1 in Paris was indefinitely postponed owing to the contents of a French Memorandum to Great Britain on the subject.

There was general agreement that the Treaty of Sévres must be abandoned. The British proposed to prevent renewal of Greek-Turkish hostilities in the spring by a settlement on lines as follows: (1) evacuation of Smyrna by Greeks; (2) local autonomy for zone under Turkish control; (3) safeguards for Christian minorities; (4) Rodosto-Midia line as Turco-European frontier. The contents of the French Memorandum were not revealed, but presumably expressed the unwillingness of France to give up a policy favorable to Turkey, on the ground that Greek occupa-

tion of Western Asia Minor meant British predominance, and that internationalization of the Dardanelles meant British naval control. On these accounts France was reluctant to abandon the Angora Treaty with the young Turks.

### SOUTHERN AND EASTERN EUROPE

**FALL OF AUSTRIAN MINISTRY.**—The Schober Ministry in Austria resigned on January 26. Although the ministry had been supported by the Pan-German party, this party was responsible for its fall, owing to opposition to the economic treaty with Tzechoslovakia. The treaty was ratified, however, and should tend ultimately to improve Austria's economic situation. Austrian finances stood in dire need of an international loan, held up until the passage of the Foreign Debts Bill in the U. S. Senate would enable the U. S. Government to waive its claim on Austrian resources.

**ELECTION OF POPE.**—Pope Benedict XV died on January 22, after holding the papal chair since September of 1914. On February 3 the College of Cardinals went into secret conclave for the election of a successor, the choice finally being Cardinal Ratti.

**ITALIAN CABINET OVERTHROWN.**—The Bonomi Cabinet in Italy resigned on February 2, after losing the support of 150 votes of the Democratic party. The Ministry had been strongly opposed by Fascisti and Nationalists.

### UNITED STATES

**BULGARIAN TREATY.**—On February 3 the Bulgarian Cabinet approved a treaty of amity and commerce with the United States. The treaty is intended to protect American interests in view of Allied reparations claims, and follows the general lines of the German and Austrian peace treaties, save that in the case of Bulgaria there was no declaration of war.

**FOREIGN DEBTS BILL PASSED.**—On January 31 the Senate by a vote of 39 to 29 passed the bill to refund the \$11,000,000,000 foreign debts into securities maturing in not more than twenty-five years, to bear interest at not less than four and one-half per cent. Control is put in the hands of a commission of five, probably consisting of three cabinet members and representatives of the House and Senate, for a term of not more than three years. The Senate amendments were approved by the House and the bill was sent to the President, who signed it in spite of objections to the limitations on time and rate of interest.

**ARBITRATION OF CHILI-PERU DISPUTE.**—On January 20 it was announced that both Chili and Peru had accepted invitations of President Harding to send delegates to Washington to discuss means of settling their long-standing dispute over the coast provinces of Tacna and Arica. Chili's proposals for a plebiscite were unacceptable to Peru, who, desired a revision of the whole Treaty of Ancor.

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KEEP THE INSTITUTE INFORMED OF YOUR  
ADDRESS

It is earnestly requested that members send in their correct addresses whenever they make a change; for unless they do, we shall be unable to guarantee prompt delivery of their PROCEEDINGS, as issued.

SECRETARY AND TREASURER.

## NOTICE TO MEMBERS

More members, both regular and associate, are desired. Any increase in membership invariably means a larger number of articles submitted, and consequently an improvement in the PROCEEDINGS.

You are requested to send or give the attached slip to someone eligible for membership, urging him to join.

By direction of the Board of Control.

Attention is invited to extracts from the constitution on the opposite page as to the requirements in making applications for life, regular and associate membership.

*To the Secretary and Treasurer,  
U. S. Naval Institute,  
Annapolis, Md.*

*Dear Sir:*

*Please enroll my name as a*  $\left\{ \begin{array}{l} \text{regular} \\ \text{associate} \end{array} \right\}$  *member of the U. S. Naval Institute from* .....

*Very truly yours,*

Members are liable for the payment of the annual dues until the date of the receipt of their resignation in writing. Annual dues \$3.00.

.....1922.

## NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-ninth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

### ARTICLE VII

Sec. 1. The Institute shall consist of regular life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nomination shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life

membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

## ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, \$3.50; enlisted men, U. S. Navy, \$3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.



## SPECIAL NOTICE

### NAVAL INSTITUTE PRIZE, 1923

A prize of two hundred dollars, with a gold medal and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the opposite page are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1922 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1922. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1922 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control is selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

F. M. ROBINSON,

*Lieut. Commander, U. S. Navy, Secretary and Treasurer.*

## TOPICS FOR ARTICLES

SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

The Naval Policy of the United States.  
The Navy: Its Past, Present and Future.  
The Fighting Fleet of the Future.  
Factors Governing American Naval Strength, Absolute and Relative.  
The Navy in Battle; Operations of Air, Surface and Underwater Craft.  
Escort and Defense of Oversea Military Expeditions.  
The Place of Mines in Future Naval Warfare and the Rules Which Should Govern Their Use.  
The Relation of Naval Communication to Naval Strategy.  
The Influence of Topography on Strategy.  
International Law.  
Principles on Which Should be Founded the Freedom of Neutral Shipping on the High Seas.  
The Present Rule of Neutrality Regarding Contraband and Blockade—Is It Justifiable in Ethics or in Expediency?  
What Will be the Status of the Submarine in International Law?  
Aircraft—Its Place in Naval Warfare.  
Aircraft, Practical Power of.  
Aircraft Warfare, Laws of.  
Aviation—Its Present Status and its Probable Influence on Strategy and Tactics.  
The Control of the Sea from Above.  
The Navy Air Service, Its Possibilities, Rôle and Future Development.  
The Anti-Aircraft Problem from the Navy's Viewpoint.  
Surface Craft, Future Rôle of.  
Armor or High Speed for Large Surface Vessels.  
Naval Gunnery of To-day, the Problems of Long Range and Indirect Fire.  
Mode of Design and Armament of Ships to Meet the New Conditions of Aerial and Sub-Surface Attack.  
Future Development of the Naval Shore Establishment.  
Naval Bases, Their Number, Location and Equipment.  
Strategic Requirements of the Pearl Harbor Naval Station.  
The Navy Yard as an Industrial Establishment.  
A Mobilization Program for the Future.  
Naval Organization from the Viewpoint of Liaison in Peace and War Between the Navy and the Nation.  
Organization of a Naval Communication Service.  
Scope of Naval Industry Activity and the Navy's Relation of Naval Strength.  
Social and Industrial Conditions in Relation to the Development of Naval Strength.  
The Future of the Naval Officers' Profession.  
The Naval Officer and the Civilian.  
The Naval Officer as a Diplomat.  
The Mission of the Naval Academy in the Molding of Character.  
The Limits of Specialization in Naval Training.  
The Training of Communication Officers.  
Navy Spirit—Its Value to the Service and to the Country.

Morale Building.

Military Character.

Amalgamation of the Supply Corps, Construction Corps and Civil Engineering Corps with the Line of the Navy.

The Influence of the Term of Enlistment on the Efficiency of the Service.

Shore Duty for Enlisted Men.

Physical Factors in Efficiency.

Health of Personnel in Relation to Morale.

America as a Maritime Nation.

Our New Merchant Marine.

The Adaptability of Oil Engines to all Classes of War Vessels.

# United States Naval Institute

## Proceedings

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EDITED BY F. M. ROBINSON



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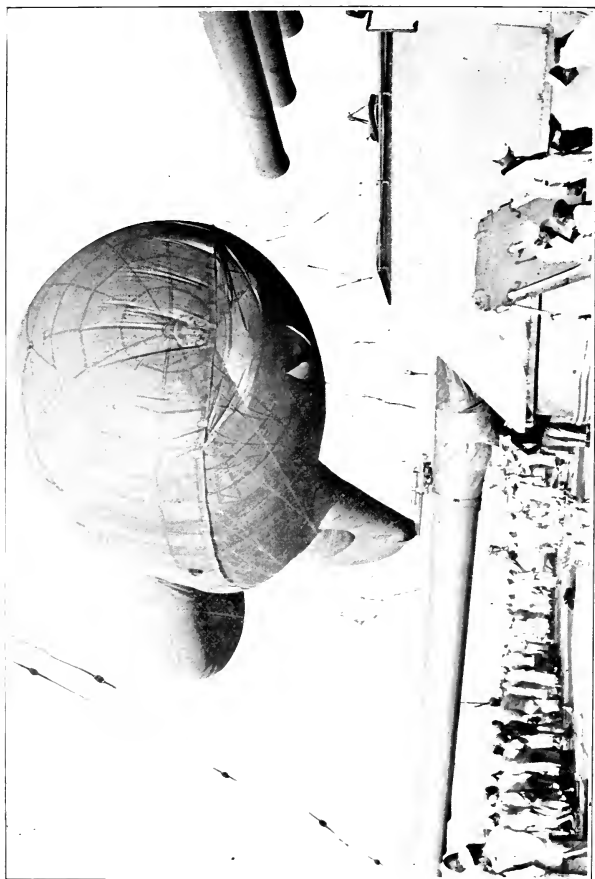
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## RIGID AIRSHIPS IN THE UNITED STATES NAVY

BY LIEUTENANT R. G. PENNOYER, U. S. N.

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### HISTORY

Since rigid airships undoubtedly will in the near future be attached to our fleet, it is believed that information concerning their general characteristics and possible sphere of usefulness to the fleet will be of interest to the service at large.

The first practical rigid airship was constructed by Count Von Zeppelin as early as the year 1900. This remarkable man was a German military observer with the Union forces during our own Civil War, and it will be remembered that it was during this war that a free balloon was released for the purpose of obtaining information for the first time in the history of human warfare. This was observed by Count Von Zeppelin, who realized how wonderful it would be if propelling machinery could be installed in a balloon so that it could be directed where desired. A few years later he watched with interest the development of the non-rigid and semi-rigid types of airships in France and became convinced that a rigid type was not only possible, but if successful would be a distinct improvement over the others. Accordingly Count Zeppelin employed two German engineers to assist him in the design of a rigid airship. His first ship was flown from Lake

Constance during the summer of 1900 and although a speed of only seventeen miles per hour was attained, the maneuverability was considered excellent and the ship a success. This ship was later destroyed by a storm, no housing facilities having been provided, but it was the large and rather healthy child which was the prototype of all that have since been brought forth in Germany and elsewhere. The Zeppelin, as these ships were popularly called by the German people after the designer, went through many vicissitudes and disasters due to lack of proper facilities for handling and housing and to lack of experience. At the outbreak of war in August, 1914, out of the twenty-six airships which had been built by the Germans fourteen had been destroyed from one cause or another, so that only twelve ships were available for military purposes. The size and power of these ships were considerably increased over the earlier ships, several having a capacity of nearly one million cubic feet and with almost a thousand horsepower, and a speed of fifty-five miles per hour.

In the early stages of the war, the Germans used these ships for raids on the English coast and industrial centers, and since the British had little or no defense to offer against them the moral and material effect was, contrary to general belief, exceedingly great, especially that of the raids directed against the industrial cities of the Midlands. The British Secret Service was excellent, and in almost all cases obtained advance warning of an intended raid, whereupon all blast furnaces would be closed down and fires banked so as not to give their position away at night to the enemy raiders. This closing down of blast furnaces in a city like Sheffield, which was turning out tremendous quantities of war materials, necessarily disrupted the organization and cut down the production of munitions which were sorely needed by the British army in the early part of the war. As the defences of these cities were perfected, these raids became less effective and were finally abandoned by the Germans, but not before a great many of these airships had been lost.

Rigid airship construction was not started in Great Britain until 1911, and nothing of any real importance was evolved until the Admiralty decided on a design similar to the German *L-33*, which was brought down in England almost intact during the year 1916. Orders for two of this class were placed in November,

1916, and were known as the *R-33* class. The famous *R-34*, which crossed the Atlantic and recrossed in July, 1919, was the second of this class. These two ships were not completed until May, 1919.

During the war the United States Navy Department saw the value of the rigid airship for naval use and the General Board recommended that this type of craft should be provided for the navy. In due course Congress appropriated funds for two ships, one to be built in the United States and the other to be purchased abroad.

In the month of October, 1919, the Navy Department instructed the Commander, U. S. Naval Forces Operating in European Waters, to enter into negotiations with the British Air Ministry for the purchase of the rigid airship *R-38*, which ship represented the latest design in airship development in Great Britain. These negotiations were completed to the mutual advantage of both parties. At the same time arrangements were made for the training of a U. S. naval crew for the ship.

The trials of the *R-38*, renamed the *ZR-2*, were conducted during the past summer, and it was during her last trial flight on August 24, 1921, that disaster overtook this airship, and the whole civilized world was stunned by the terrible catastrophe which took place near the city of Hull, England, resulting in the loss of forty-five of the forty-nine persons on board.

Many times I have been asked to state the cause of this accident and in passing it might be of interest to cover this point. The *ZR-2* was the largest airship that has ever been constructed and several distinct departures were made in the design. She was roughly of 300,000 cubic feet greater capacity than the *L-72*, the last and largest German rigid to be completed, and to obtain this volume the diameter was increased over that of the *L-72*.

During the construction of the ship various tests were given to ascertain if the structure would have the required strength, and on some of these tests it was found necessary to strengthen the hull structure.

On the third trial flight of this airship held on the seventeenth and eighteenth of July, when attempting to make full speed on four engines, the hull structure started to fracture in several places. The engines were immediately stopped and further

damage averted. She was then flown slowly back to her base and landed without further incident. A conference was held immediately after this flight, in which it was decided to strengthen the ship throughout the under side of the parallel body; that is, from frame four forward to frame nine aft. (The *ZR-2* had fifteen main frames.)

It was on the flight following the completion of this strengthening that the disaster occurred.

Various and sundry tests were to be carried out on this flight, the last test to be a rapid movement of the rudders in both directions. A full speed trial lasting about fifteen minutes had been conducted successfully, in which the ship attained a speed of over sixty knots. Shortly afterward, rudder trials were started with the ship's speed about fifty-four knots. During these tests the ship's structure failed between frames nine and ten (the strengthening was only carried back as far as frame nine) and completely separated into two parts. The gasoline leads were severed and a fire started in the after end of the forward portion almost at the moment of fracture. An explosion followed shortly after, causing the collapse of this portion, and as it struck the water a second explosion occurred.

The after portion descended slowly into the Humber River without catching on fire, and four of the five survivors were in this part.

From all the evidence it appears that this airship was weak structurally, and that the rapid movements of the rudders caused a strain which the structure could not stand, and the ship fractured aft of the portion which had been strengthened. •

The construction of a rigid airship presents some very difficult problems in design, and some of the calculations involved are almost impossible of solution in the present state of the art. As with most design work, most calculations are based on past experience, and the experience is limited.

We must remember that rigid airships are very modern indeed, and the *ZR-2* was the largest rigid airship that had ever before been attempted. In many instances the designers were entering entirely new fields. In this connection naval constructors have been designing ships since the time of Noah, but even with the thousands of years of experience behind us, ships that sail the

seas sometimes prove to be structurally weak. Compare this experience with the very limited experience designers have had with rigid airships, and one marvels they have gone so far.

#### A GERMAN RIGID FOR THE UNITED STATES

In December, 1918, after the signing of the Armistice, a commission of aeronautical experts visited Germany and found a total of seven rigid airships intact in their hangars. These were subsequently assigned to the Allies as follows: two to England; two to France; two to Italy; and one to Japan.

In considering the allocation of these German rigid airships, the Supreme Council made a decision in September, 1919, that France and Great Britain should have a choice of the two best airships left in Germany, the choice to be exercised in the order named. (France chose the *L-72* and Great Britain the *L-71*, which were subsequently delivered.) The remaining rigid airships were to be distributed to the United States, Italy, Great Britain, France, Japan, and Belgium, each power to exercise one choice in alternate rotation.

In view of the fact that the United States did not ratify the Treaty of Versailles, she did not exercise her right of choice.

When the United States signed a separate treaty of peace with Germany, she reserved all the rights that might otherwise have accrued to her if she had been a signatory power at the Treaty of Versailles.

By virtue of these reservations, the United States claimed the right of delivery of a rigid airship by Germany to the United States.

On the sixteenth of December, 1921, at the 157th meeting of the Conference of Ambassadors, this right of the United States was acknowledged and it was further agreed that the United States should have constructed in Germany at Friedrichshafen on Lake Constance a dirigible of approximately the *L-70* type (about 2,400,000 cubic feet capacity).

The president of the Inter-Allied Aeronautical Commission of Control was accordingly instructed to take the necessary steps to see that the construction of this ship was started immediately.

It was also agreed by the United States that this ship would be devoted to purely civil purposes, and in view of this it is

contemplated that this ship will incorporate a passenger car in the design, somewhat similar to the passenger cars which have been included in former commercial rigid airships.

The Joint Army and Navy Board agreed that the acquisition of a German airship should be left to the navy and accordingly the navy was designated as the government department to handle all matters in connection with the acquisition of this ship.

Work in connection with the construction of this airship is progressing and naval officers have been detailed to the works of the Zeppelin Company as inspectors.

In view of the fact that the Germans were required to deliver all other airships to the Allied countries, the same requirement is to be exacted in this instance and this rigid dirigible delivered at the Naval Air Station, Lakehurst, N. J., where the navy has completed the construction of the world's largest airship hangar.

Some one has said that "The proof of the pudding is in the eating." In this case the proof of the ship is in the delivery.

Some may ask the question, "What does the navy want with a commercial type airship?" It is of course acknowledged that the Germans probably know more about the design, construction, and operation of rigid airships than any other people, and the experience to be gained by our design staff and operating personnel is invaluable, and this experience can be gained just as well with this type as with a purely military ship. Also, following the destruction of the *ZR-2*, the American public has to a great extent lost faith in the rigid airship, and they need to see such ships flying about carrying passengers in order to regain their lost faith, so that the navy may not be handicapped by lack of funds for their future development.

As previously stated, the total gas capacity is estimated at 2,400,000 cubic feet. In common parlance, the gas capacity of an airship is the total volume of gas contained in the gas bags when full, the ship being at sea level and with normal atmospheric conditions. The largest previous ships to be commissioned were the German *L-70* class, which had a gas capacity of about 2,400,000 cubic feet and were designed and constructed for the purpose of bombing New York. These ships were completed just prior to the armistice, and in accordance with the terms of



the peace treaty have since been surrendered to Great Britain and France.

The total lift of this latest airship is estimated at about seventy-two and eight-tenths tons. The "total lift" is the difference between the weight of air displaced and the weight of the gas used (hydrogen), the gas bags being full. Part of this lift or buoyancy is required to lift the ship or, as it is technically expressed, the "fixed weights." These include the hull, gas bags, car, and machinery weights, gasoline tanks, etc.; in other words, the fixed weights necessarily carried in flight, but which cannot be moved. In this case the fixed weights are estimated at thirty-five and four-tenths tons. The difference between the ship's total lift and the fixed weights gives the lift disposable for crew, passengers, fuel, water ballast, food, bombs, ammunition, etc., and is called the "disposable lift." This works out at approximately thirty-seven and four-tenths tons for a passenger-carrying ship of the above gas capacity.

Mere figures are of little value for purposes of illustration. However, to visualize the dimensions of this huge craft, compare its length overall of 743 feet with the overall length of our largest battleship afloat (a little over 600 feet); nor does the overall width of approximately ninety feet compare unfavorably with the *Maryland*, which has only a slightly greater beam. In this way, it is possible to picture these air monsters.

The hull of a modern Zeppelin consists of transverse frames or rings, made of duralumin, rigidly connected to longitudinal members of the same material, the rectangular panels formed between longitudinals being braced diagonally by what are known as diagonal wires, the whole forming a built-up tube, over which an outer cover of fabric (somewhat similar to airplane fabric) is secured. This structure is tapered at the ends to give a streamline form. An internal keel or corridor is fitted of triangular or trapezoidal shape in cross section, the base of which forms the bottom side of the ship, and runs practically the whole length. In this keel are fitted the gasoline and oil tanks, water ballast bags, crew's space, and other accessories. A walking way is fitted along the bottom of the keel on the middle line, to allow passage between different parts of the ship. This walking way is somewhat narrow (about eight inches wide) and if in flight a person should

accidentally step off, there is nothing between him and the great open spaces, except the outer cover of fabric. A line is strung along the top of the keel which is grasped when walking along the corridor, and until one becomes accustomed to it, this is grasped rather anxiously.

The transverse frames or rings are made rigid by fitting across them diaphragms of wire. These diaphragms also act as bulkheads separating the adjacent gas bags. These transverse frames are of polygonal shape, each side of the polygon forming a side of the ship. In the *L-70* class there are sixteen of these main transverse frames, which form with their wiring the longitudinal boundaries of the gas bag sections. There are therefore fifteen gas bags in this type ship.

The gas bags are made of cotton fabric, lined with goldbeater's skin to make them tight. Automatic gas valves are fitted to each gas bag to permit escape of gas when necessary. Cowls are fitted along the top of the ship to permit escape of this gas and also to assist ventilation of the keel and crew's quarters.

A control cabin of duralumin structure is built into the under side of the hull in the fore part. This cabin corresponds to the bridge of a ship, and contains the elevator and rudder controls, engine room telegraphs, telephone, navigating instruments, charts, tables, radio cabin, instruments, and signalling devices, besides various minor controls. Normally while in flight the following persons are on duty in the control cabin: captain, navigator, quartermaster at the wheel (rudder controls), height coxswain (elevator controls), radio operator (in radio cabin), and when coming in to the landing field, one man standing by engine room telegraphs, and a signalman standing by for visual signals.

This airship will have engine cars slung from the hull of the ship, by means of wires ropes and struts, each car containing one Zeppelin Maybach engine, with necessary instruments and controls. Each engine develops three hundred brake horsepower at 1,400 r. p. m. Access to these engine cars is obtained by gangways or ladders from the cross passages of the keel. One set of wing engines are fitted with reversing gear, so as to make maneuvering easier when coming in to the landing field.

## PERFORMANCE

A military airship of the above gas capacity would have a maximum speed of sixty knots and carry sufficient fuel to give her a radius of action of about 4,500 nautical miles at this speed. Of course no ship can be expected to cruise at full speed continuously. However, at a cruising speed of forty-five knots, a radius of action well over 7,000 nautical miles can be expected. Hence, with favorable weather conditions, such a ship would be able to cruise from any port, on the Pacific Coast of the United States to Honolulu, and thence to Manila, without once being required to land and refuel. Truly a wonderful range, but it is even more wonderful when we consider that such a flight could be made in seven days.

Most of us are familiar with the double crossing of the Atlantic by the British rigid airship *R-34* during the month of July, 1919. This ship had a gas capacity of approximately 2,000,000 cubic feet and her power plant consisted of five 270 horse-power Sunbeam "Maori" engines. She shoved off on her "great adventure," from the airship base at East Fortune, near Edinburgh, Scotland, at 1:48 A. M. G. M. T., July 2, and, after encountering adverse winds and weather, finally landed at Mineola, Long Island, at 2 P. M. G. M. T., July 6, with only two hours' fuel supply remaining on board. The time taken to cover the 3,100 nautical miles was 108 hours. The return trip was started at 3:54 A. M. G. M. T., on July 10, and ended three days, three hours, and three minutes later at Pulham, Norfolk, England.

Probably the most remarkable flight ever accomplished by an airship was made during the war by a German Zeppelin. This flight was made from Jamboli in Bulgaria to German East Africa and return. The Zeppelin was of the naval *L-59* class, and had the same gas capacity and many characteristics in common with the later *L-70* class. The ship left Jamboli at 8:35 A. M. on November 21, 1917, with a crew of twenty-two men, and carried medical supplies, munitions, and special instructions for General Von Lettow, commander of the German forces in East Africa. She crossed over the Mediterranean, flew over Cairo and Khartoum, being seen at both of these places, and followed the Nile River to Lake Victoria Nyanza, where she received radio mes-

sages from the high-powered station at Nauen, Germany, to return to Bulgaria, since the German forces in East Africa had been captured. She accordingly turned back and arrived safely at Jamboli at 7:35 A. M., November 25, having completed a round trip non-stop flight of about 4,300 miles in the remarkable time of ninety-five hours. This represents an average speed of forty-five miles an hour.

#### NAVAL USES

Officers of experience in the navy often ask the questions: "What use are rigid airships?" "What do we want with them?" These questions have been answered by no less an authority than Admiral Lord Jellicoe, commander-in-chief of the British grand fleet at the battle of Jutland. In his book, *The Naval Crisis*, he makes the assertion that one rigid airship, for purposes of naval scouting, is worth two scout cruisers. If anything, this is an understatement of their value, since in this capacity they are undoubtedly without a serious rival. One need only consider their range, speed and endurance to realize this. Think of the advantage of having a scout capable of ranging about over the sea with the fleet and ready when needed to proceed in search of information at a speed of sixty knots. Suppose adverse weather conditions are encountered and the airship has to buck a thirty-knot wind. It is still capable of making a speed of thirty knots over the sea. Even under these adverse conditions, the airship still maintains her superiority over the sea scout, for what surface craft can run at full speed into a thirty-knot wind?

A stiff wind has very little effect on an airship, except in so far as it affects its progress. The steadiness of an airship in a squall has been remarked upon by the late Air Commodore Maitland, C. M. G., D. S. O., A. F. C., R. A. F., in his book, *The Log of H. M. A. R-34*, an excerpt from which reads as follows:

7:10 P. M. Struck by a fierce squall. Heavy rain. Ship remarkably steady considering intensity of the squall.

The rain is driving through the roof of the fore car in many places, and there is a thin film of water over the chart table. The wind is roaring to such an extent that we have to shout to make ourselves heard.

Am struck by the steadiness of the ship in this squall, which is a very severe one. Beyond a gradual and very slow pitching, causing us to hold

on and making everything slip about very considerably, we feel no inconvenience and not the slightest symptoms of seasickness. The sea, on the other hand, when we last saw it, was very rough and I, for one, being the worst possible sailor, would certainly be feeling horribly ill.

In addition to the speed superiority, the visibility from an airship is much greater than from a surface craft.

As a scout, the airship also has the advantage of being able to obtain information with respect to an enemy's main body without the necessity of fighting an engagement with the enemy's advance force. It is also possible, by hovering about in the clouds, to obtain such information without being seen. Even if discovered and enemy fighting craft are sent out to drive the ship away, the information will already be obtained and it is a simple matter to climb and escape into the clouds. It is not possible for heavier-than-air craft to climb as rapidly as a rigid airship. In addition, fighting aircraft may be carried by sacrificing the number of bombs carried by the airship.

While it is admitted that the Germans employed their Zeppelins in raiding expeditions for some time after an efficient defence had been developed against them, it is known that even with the small bombs in use and with the poorly constructed and inaccurate bomb sight employed in the first part of the war, from 1914 to 1916, a great deal of damage was done by them, far more than was admitted at the time, which is proved by statistics published since the war. Consider then the effectiveness of a fleet of rigid airships, similar to the *ZR-2*, each capable of carrying a number of high explosive bombs weighing a ton each, when directed against the navy yards, arsenals, and advance bases, particularly at the outbreak of, and following closely on the heels of a declaration of war. Unless these places were adequately defended (and few of them are) the effect would be paralyzing.

For convoy they are particularly useful due to their superior vision, speed, and range of action, and for the same reason they are very effective for anti-submarine patrol. During the late war the British used these ships effectively for convoy and anti-submarine patrol duties.

In time of peace these ships will have a multiplicity of uses for the fleet. For example, during target or torpedo practice, the airship could hover directly over the target so that photographs

could be taken which would form a permanent and accurate record of the practice.

Also the control car of a rigid airship would be an excellent position from which to view the fleet at maneuvers, or during the latter stages of a war game. Any one who has ever flown appreciates the detail with which everything below is shown, and the different moves of the opposing forces could be observed much the same as the chess player observes the moves of his antagonist on the chess board.

On account of their speed and endurance, these ships will undoubtedly be most useful for rapid communication with our outlying possessions of Hawaii, Guam, and the Philippines, and tend to knit them more closely into the defence of the Pacific.

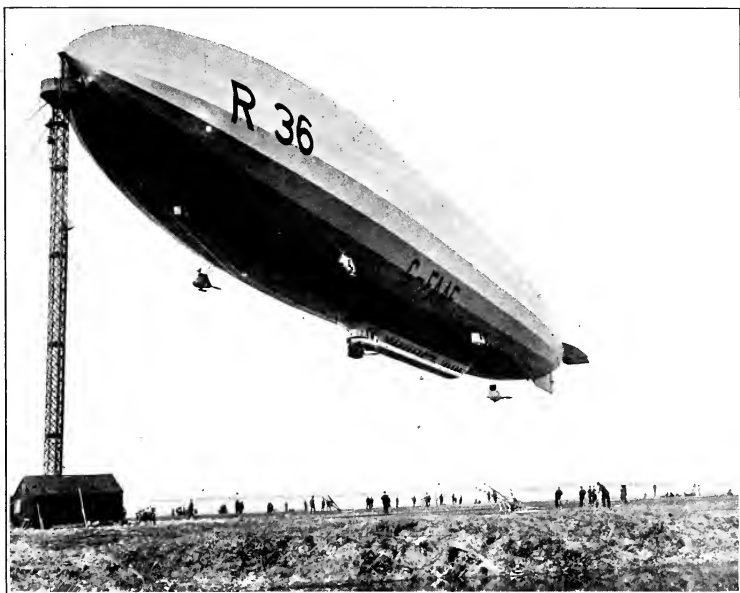
### HANDLING

Although an airship has little to fear from any except the strongest winds when she is in the air, great difficulty has been experienced in handling her on the ground and even under normal conditions a handling party of from two to four hundred men is necessary. That is the reason there were no Zeppelins present with the German high sea fleet until the second day of the battle of Jutland. Although the wind was not particularly high, it was sufficient to prevent the ships being taken from their hangars. However, the second day of the battle a few Zeppelins were taken out of their sheds, and these assisted the scattered units of the German fleet to regain their base successfully.

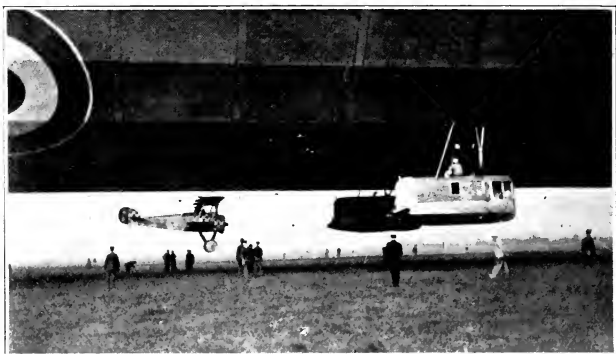
It was therefore very essential for the future of airships that some method be evolved whereby they would be as independent of their sheds as a transatlantic liner is of a dry dock. This has been successfully accomplished by the mooring mast.

The mooring mast consists of a steel structure about 150 feet in height, and the airship is secured, by a bow mooring gear, to a special attachment at the top of this mast.

To moor, the airship approaches the landing field as for a normal landing. Previous to this a special wire cable, wound on a drum and operated from a winch at the foot of the mast, is carried up the mast through the mooring attachment and veered out to the ground in a direction opposite to that from which the wind is blowing, a distance of about 600 feet from



COMMERCIAL AIRSHIP R 36 RIDING TO A MOORING MAST



RIGID AIRSHIPS LEAVING GROUND WITH SOPWITH CAMEL FIGHTING  
AIRPLANE SECURED BENEATH



the foot of the mast, the end of the cable being marked by a red flag. The ship is headed into the wind and brought directly over this flag, the ship having an altitude of about 500 feet, and at this instant the airship's mooring cable is released, the end being weighted, and when it strikes the ground, a man stationed there for this purpose, quickly connects the ends of the two cables together, by means of a special coupling. The ship's engines are then stopped and she is permitted to rise slowly until she rides from the cable at an altitude of about 1,200 feet, the weight of the cable tending to gradually stop the ascent of the ship. The winch is now started and the cable reeled in until the nose of the ship is hauled to the top of the mast and properly secured. The mooring attachment at the top of the mast is mounted on a ball bearing so that it may revolve freely and thus permit the airship to swing head to the wind, at the same time holding the ship rigidly.

Fuel, gas, and water lines are carried up the mast to the upper platform, where they may be connected to the ship's systems, and the ship refueled or gassed without the slightest difficulty.

Airships have been moored out to a mast for months on end without the slightest trouble, and have been released from the mast in winds of about fifty miles per hour, and moored to the mast in winds of slightly less force. The most remarkable part of the whole operation is the fact that only one man is needed to unmoor and only six men needed to moor the largest ship. When ready to unmoor, the ship is held to the mast by means of a stopper, and it is only necessary to knock off the link with a hammer to release the ship entirely from the mast.

With equipment of this sort at all fleet bases, rigid airships will be able to operate directly with the fleet at all times.



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## THE NAVAL WAR

SOME LIGHT ABOUT THE "GOEBEN'S" ESCAPE

BY CAPTAIN GABRIEL VOITOUX, FRENCH NAVY

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At the very end of July, 1914, Europe was on the brink of war. Every effort, at least on the French and British sides, to prevent the clash, had failed. The navies were prepared for action.

On the first of August the main French fleet was at Toulon, ready to put to sea within six hours' delay. It was there, a force, alas, *not well balanced*, but having had a good training in the hands of an admiral who had proved himself one of the best French sailors, most energetic, especially while still a young man in some Indo-China war affair.

Germany kept her main fleet in the North; this fleet was ten-fold as strong as was necessary to do away with the old cruisers that France had, then, appointed to the British Channel. Besides, Germany had placed in the Mediterranean two ships of high value, the battle cruiser *Goeben* and the scout *Breslau* both of twenty-seven—twenty-eight knots; faster, by six knots, than any of the French ships.

In fact, this must be noticed once for all, France *had no battle cruiser type*; as for scouts, she possessed nothing that could be compared to the *Breslau*, or to any of the four similar ships belonging to the Austrian navy.

The Germans had placed the now famous division—*Goeben* and *Breslau*—in the Mediterranean with the exclusive purpose of interfering with the transportation of the French 19th Corps from North Africa to France.

Strange to say, the *Goëben* could outrange the French ships by some 4,000 meters, and outspeed the fastest of them by six knots. So, unless caught in the meshes of a net of French ships and, trying to escape, being forced to approach within the range of some of them, the Germans ran no risk of being fought by French men-of-war; even coming in their range, the *Goëben's* artillery was heavier than the guns mounted on every French ship, with the exception of dreadnoughts; these were armed with 305 and 340; but, as said above, they had a lesser range than the *Goëben's* 280. Must I add that the French *armoured cruisers* were a great deal inferior to the *battle cruiser "Goëben"* in *protection* and *artillery* as well as in *speed*?

The Austrian navy, of a strength about three-fifths that of the French, included four scout cruisers averaging twenty-five—twenty-six knots, of a class, as said before, that France was entirely deprived. Those scouts, together with the German *Goëben* and *Breslau*, might have made a great havoc among the French troopships had they not been hampered, as will be seen further on.

Italy was an ally to Germany. But she had refused to back Austria, some twelve months previously, against Serbia. It was not likely that she would take arms against the Entente. But nobody, previous to the fourth of August, could tell what step she would choose. Her navy was stronger than the Austrians; still it came after the French.

Great Britain, of course, was not likely to become an enemy of France with which she entertained an *entente cordiale*. But no one could, then, be assured whether she would enter the conflict or not. This assurance came on the fifth, when she deliberately decided to take part in the hostilities. Had it been some twelve hours sooner the war would have probably ended a short time after the event. In fact, on the fourth the British forces had met and vainly followed the Germans, but, as was written before, "Time of saluting was past, but time of war had not yet come." And, thus, the opportunity of finishing the two Germans was missed. Nobody could, then, guess, how profitable this miss would be to the Germans.

The British forces in Mediterranean were carefully selected: three battle cruisers, like the *Goëben*; three scouts, like the *Breslau*.

These six ships were undoubtedly appointed to the Mediterranean to, eventually, overcome by three to one the German division. Besides, Great Britain entertained on this station four armoured cruisers, some fifteen destroyers and twelve submarines.

As can be already seen, the mission of the *Goëben*, *Breslau* would be barred if the British took part in the war. But the Germans hoped to the last that they could prevent such eventuality and keep Great Britain neutral.

According to the Franco-British agreement, following, I suppose, the *entente cordiale* established, the French navy was to control the *Western* Mediterranean, while the British would perform the same duty over the *Eastern* part. Neither of the two commanders was to control the other; it was plainly prescribed that each one of them, according to the circumstances, could enter the other's waters to give him assistance without, in any way, placing himself under his command. This part of the agreement was modified in London on the sixth of August. It was, there and then, decided that the whole Mediterranean forces would, henceforth, be placed under a French admiral's command. This change was notified to the French commander on the eighth. But, in fact, by an express order from the French Ministry of Marine, the command was only transmitted on the thirteenth, when Admiral Milne was called back to England. The apparent cause of this delay was that the French Commander was a vice-admiral while the British was an admiral.

#### A NAVAL POLICY HANDICAP

Before going through describing the operations, from the start to the *Goëben's* rush through the Dardanelles, I must indicate how, according to my opinion, the British naval operations were handicapped.

Before 1914 nobody knew what a naval war would be like with the new weapon introduced: *the submarine*. Of course, through numerous exercises, its offensive power had been revealed, but as to the means of meeting the danger, the Admiralties were out of wits, for there had been no war experience to throw any light on the subject. When some young officer happened to succeed in attacking, his admiral barely acknowledged the fact—when he did not receive the report with a rebuke.

Still the submarine warfare (U-boat torpedoes and mines) was so impressive on the Admiralty that, for its natural spirit of *offensive* was substituted that of *defensive*, which had never before been the British policy.

This defensive policy can be read in Admiral Jellicoe's memorandum written on the eve of the war. There he clearly describes his purpose to meet destroyers' and submarines' attacks by a *turn away*. He declares as well that, were the circumstances such that he should be brought to believe that the German battle fleet tried to draw the British over a mine field, or in the vicinity of submarines, he would cease the pursuit. The maintenance, at all cost, of the British naval superiority haunts his mind and fortifies this defensive policy, which was not Admiral Jellicoe's monopoly, whose views were backed by the Admiralty itself who originated it. This is well brought to light by the Admiralty's orders given at the very beginning of the war to Admiral Milne and, consequently, to Admiral Troubridge, his second in the Mediterranean; orders which can be summed up in these words: "*Avoid premature action with a stronger force than yours.*"

Through the course of pre-war maneuvers, with Admiral Beatty as antagonist, the same defensive policy led Admiral Jellicoe's actions, according to Mr. Filson Young's recent book: "*To avoid Beatty's destroyers' attacks, Admiral Jellicoe regularly employed the method of turning his ships away.*" Mr. Young says that, while being on board Admiral Beatty's flagship *Lion*, and noticing this very *turn away* maneuver, he was told by an officer of the staff, "*If he does that when the enemy attacks, he can't be defeated, but he can't win.*" The experience at Jutland, even at Dogger Bank, proved this prophecy.

By this digression, I only want to inform the reader that a defensive policy, due to torpedoes, submarines and mines, prevailed in most naval circles, though not in the minds of all the naval chiefs. Beatty had a real offensive spirit, and I must say, that such offensive spirit reigned in all naval French circles, without a single exception.

#### PRELIMINARY REMARK

The French commander was ordered by the French Government not to convoy the troopships as had been previously intended,

the war minister accepting the responsibility of their sailing without an escort. It must be, here, noticed that these troopships were to sail from all the ports of North Africa, including, of course, Bizerte, Bône, Philippeville, and so on, up to the ports of Morocco.

#### POSITION OF THE BELLIGERENT FORCES ON THE FIRST OF AUGUST

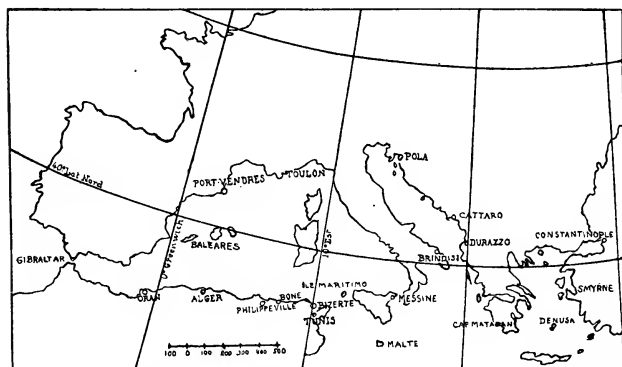
French Fleet—Toulon, ready on six hours' notice to sail. Waiting for an order.

British Forces—Undoubtedly Malta.

German Division—Messine, together with the German liner *General*.

Austrian Fleet—In the Adriatic, Pola, Cattaro.

Italian Fleet—In the Italian harbours.



#### EVENTS OF THE SECOND OF AUGUST

1:00 A. M.—*Goëben* and *Breslau*, under Admiral Souchon, sail from Messine bound to an unknown destination.

4:53 P. M.—The French admiral, still at Toulon, learns that the German ships are said to be in the vicinity of Bizerte, no doubt ready to interfere with the French troops' transportation when the war shall be declared. The French admiral is still at Toulon awaiting for orders. So far, there is no clue about the British, the Austrian, and the Italian forces.

7:00 P. M.—The Germans having been reported in the vicinity of Bizerte, the French admiral judges that the troopships should be in danger of encountering them, so he sends orders forbidding any sailing without an escort, *thus infringing willingly the orders he had received not to convoy*. At the time being, the French admiral is still awaiting the order to put to sea.

10:50 P. M.—At last, the French commander receives the following order: "*Put to sea and stop the 'Goëben' and 'Breslau' if war is declared.*"

"Stop the *Goëben*" was as easy a task as to put a bit of salt on a bird's tail to catch it.

#### EVENTS OF THE THIRD OF AUGUST

7:00 A. M.—The whole Mediterranean French fleet is at sea, the three squadrons forming a fan heading at twelve knots: the left, and strongest one, for Philippeville; the middle one for Bougie; the right one for the Baleares, and next Oran. At the end of this very day the whole fleet is somewhere on a parallel of Minorque. So far, there is no other news about the Germans.

Meanwhile, the French commander had received two informations: The first, 1:13 A. M., from Paris before leaving Toulon, "*The German boats sailed from Messine.*"

The reader will note, here, that *hour* and *direction* are missing. Now, this report could be of no help to the French admiral, for on the eve, at 1 A. M. *Goëben* had been reported leaving Messine and, later on, being in Bizerte's vicinity. This lack of accuracy about informations will occur many a time through the operations against the *Goëben*.

The second, 1:30 P. M., the British admiral offers his services to the French commander: "*In what way shall I help you the best?*" and was answered: "*In dealing with the German cruisers.*" Remark here that England and Germany were not yet at war.

6:00 P. M.—Admiral Souchon, who was really close to Bizerte, learns the breaking out of war with France and is said to have received, then, the order to make way for Constantinople. But he was too close to some French ports, where he might surprise the troopships, not to attempt the chance to do some mischief before turning back to the East; besides, as Souchon declared it subsequently, he wanted to fool the French commander.



11:00 P. M.—Paris informs the French commander that a cargo, supposed to be a collier, is anchored at the Baleares, probably for the *Goëben*.

#### EVENTS OF THE FOURTH OF AUGUST

1:15 A. M.—The French admiral learns the state of war, *this about six hours after the news had reached Admiral Souchon*. As said before, the French fleet is, then, forming a fan heading southerly, the three squadrons being in the latitude of the Baleares. From the information in his possession the French admiral had no reason of changing his direction nor his speed. So far, he knows nothing of Italy's attitude and is a bit anxious because he is leaving, far behind, the coast of France unprotected.

4:50 A. M.—He learns the shelling of Bône and orders immediately full speed, same course for the three squadrons.

6:00 P. M.—A Paris radio enjoins him—*Italy being neutral*—to detach immediately some ships to convoy the *Jean Bart* and *France*, both rallying Toulon, the latter being slightly damaged. And this is, by the way, how, *incidentally*, the neutrality of Italy was brought to the French commander's knowledge, long after the notification was made to France.

6:15 A. M.—A radio brings him the news that Philippeville has, also, been shelled and that the enemy cruisers are steaming full speed westerly. Order is sent to the left squadron to incline its course to the right, towards Algiers. This motion was ordered for fear that the *Goëben* might glide along the coast and slip away to the West.

It is precisely here that intervenes the trick of Admiral Souchon who deliberately wanted to fool the French: as soon as he estimated that he could change his course without being noticed he rounded to the East and went speedily towards Messine.

Fact that the French commander could not guess, for he thought that, having left Messine, shelled Bône and Philippeville, then taken a course westerly at full speed, Admiral Souchon would never go back to the East, where it was more probable he should meet the British forces threefold stronger than his.

The French admiral had hoped for the opportunity of seizing the German cruisers into the meshes of his net. He thought that, once caught, the *Goëben*, trying to escape, would be com-

pelled to come in close range of the guns of some of his ships. But he was deprived of such an opportunity while he reached the African coast, without having seen or heard of the enemy.

11:00 A. M.—While they ran to the East, the German boats made contact with the three British battle cruisers; these followed the Germans the whole day, ready for action, if war was declared. They both made a tremendous race, one pursuing the other, with no other result than a great consumption of fuel, on both sides.

At the time, it is said, Admiral Milne tried to inform the French commander, but, if so, the radio never reached the French flagship.

4:30 P. M.—An Oran wireless informs that a battle is engaged between coast artillery and ships, *but gives no particulars about the place, nor the hour. Is it the "Goëben"?*

8:00 P. M.—The above wireless is nullified.

11 P. M.—Paris prescribes "*Place the submarine flotilla along the south coast of France, between Villefranche and Port-Vendres, as a protection against the 'Goëben.'*"

This radio was not to make the French commander guess that the *Goëben* had already left the western Mediterranean.

#### EVENTS OF THE FIFTH OF AUGUST

7:00 A. M.—Paris authorizes adequate measures to realize the security of the troopships between Casablanca and Bordeaux.

0:44 P. M.—Paris informs that the presence of auxiliary cruisers is to be feared on the south coast of France.

7:55 P. M.—Paris suspends the sailing of troopships from Morocco until the awaited concentration of the British cruisers. Meanwhile Paris lets the French admiral at liberty to assure, for the best, the security of the troops' transportation between Casablanca and Oran.

II. B.—Up to this very moment, and further, the French commander was bound to believe that the *Goëben* and *Breslau* were really in the Western Mediterranean and that, besides, auxiliary cruisers might attempt to sink the troopships. So, *instead of following the Government's previous order forbidding the convoying, he decided to escort all the troopships. He did so, of course, to protect these ships, but mainly to create the*

*opportunity of approaching the "Goëben" and "Breslau," cruisers which outsped and outranged all his ships; and, besides, of which he could not make out the real position except that, as far as the present time, they were some place or other in the Western Mediterranean, part assigned to the French.*

0:30 P. M.—Bizerte sends to the flagship *Courbet* a wireless stating "Admiral Milne with his battle cruisers, armoured<sup>1</sup> cruisers, and destroyers, is researching south of Sardinia the German cruisers which, on the fourth, 5:00 P. M., were forty miles from Marittimo heading to the East."

There is a flagrant contradiction: The Germans seen forty miles from Marittimo must have returned from their way, said to be East, by taking a new course to West. Because there was, in appearance at least, an unmistakable fact; *Admiral Milne was researching them at the south of Sardinia, some 150 miles west of Marittimo.* Admiral Milne would not have been researching the *Goëben* there if this cruiser had been elsewhere, a long way to the East. The real fact must be that the information was wrongly worded, for the British could not have been researching an enemy, some 150 or 200 miles from the place he was supposed to be, according to the report. Besides, if in the mind of the French commander, Admiral Milne was really researching the German south of Sardinia, he was bound to believe that the *Goëben* was anew trying to escape by the West. Inaccuracy of information, low speed of his ships, the need of protecting the troopships and, in doing so, get the only chance he had to approach the enemy whose real position was impossible to make out, induced and entitled the French commander to make no move to the East where, besides, adequate and very strong British forces were close to the Germans. Auxiliary cruisers had been reported in the Western Mediterranean, there was also the dreadnought *France* partly disabled. On the other part, the Algerian troopships were to sail the next day; it was better keeping the previous dispositions: If *Goëben*, or any other ship were preparing to attack them, there would be necessary forces to beat, or, at least, repulse them.

<sup>1</sup> It must be scout cruisers, but not armoured cruisers.

## EVENTS OF THE SIXTH OF AUGUST

1:45 and 4:25 P. M.—Two successive wireless messages bring to the French Admiral the certainty that *Goëben* and *Breslau* are back to Messine coaling since the morning. Then the French left squadron was some four hundred miles from Messine, much too far to make any useful move.

On account of Italy's neutrality the Germans, who were anchored since the eve, were bound to sail before night. So a rush to the East would be quite vain. Besides, what would be Admiral Souchon's next move? Was not there, close by, the fleet of Admiral Milne ready to prevent any escape?

To this end the British armoured cruisers were placed across the Otrante Canal, shutting the way, in and out, the Adriatic. The Messine north and south issues were guarded by British Scouts. Admiral Milne, handicapped by the persistent belief that Admiral Souchon would either try to go back to Pola, or leave the Mediterranean, advised the French commander that he might be later induced to take base at Bizerte, fairly west of Malta. The French admiral, himself, believed that the Germans might possibly endeavour to escape through Gibraltar. According to this belief he did not judge necessary to bring any change to the previous dispositions of his ships: They were spread at all the points from which the troopships were sailing and where, as well as an aggressor, or as a retreating ship, the *Goëben* might pass; that is to say in the very best position, with his low speed ships, to have a chance of meeting the two fast Germans. These were to leave Messine instantly, but bound to where? Admiral Souchon alone knew.

Even had the French commander known Souchon's intentions, he could not have thought an instant of pursuing the *Goëben*, which had some five hundred miles advance and was eight knots faster than the French ships, those who were strong enough to beat him: dreadnoughts only. Besides, may I repeat it, he knew perfectly well that the British were in touch with the *Goëben* and possessed, solely in battle cruisers and scout cruisers, three-fold the strength of the two, *Goëben* and *Breslau*.

We must recollect that other German ships, for instance auxiliary cruisers, had been reported by Paris, as being in the western

Mediterranean; also that the battleship *France* rallying Toulon, was partly disabled (the fact was that the dreadnought *France* was not completed and, so, very exposed on her way to Toulon). Finally that Paris had ordered some measures of security concerning the motion of troops off the Morocco and Algerian coasts.

We must anew notice that Admiral Milne, himself, thought that Admiral Souchon was either bound to Pola or the Western Mediterranean. Of course, it did not come to his mind that Souchon should take his course for Constantinople, because Bône and Philippeville are really not quite on the way from Pola to Constantinople and that lingering near and turning around a force threefold his, as he had already done, was rather hazardous and like playing with fire.

Admiral Troubridge in the meantime had barred the Otrante Canal with his four armoured cruisers and some destroyers. Scout cruisers were guarding the north and south exits of Messine. *Gloucester* was watching the south one. The battle cruisers were intended to be, according to previous orders, west of Sicilia ready to meet the enemy whether he tried to escape by the north or the south of Messine.

In fact, the run of the previous two days had made a big hole in the bunkers, and the three battle cruisers were undoubtedly coaling at Malta while the Germans had twenty-four hours coaling at Messine. Besides, we must remember that Admiral Milne, eventually, intended to take base at Bizerte, west of Malta, so strong appeared his belief that his antagonist had only two chances of escaping: Pola or Gibraltar.

On the French side, as Djemal Pacha had spent aboard the French flagship *Courbet* the last fortnight of peace time (July, 1914), the French commander was not prepared to guess that Djemal Pacha himself, and his kin, would so suddenly be so hospitable to our enemy, responsible for the war.

6:00 P. M.—The British armoured cruiser, watches at Otrante the Austrian scouts, who might try to get at the French troopships. They, as well, guard the passage by which *Goëben* might try to escape on its way towards Cattaro or Pola.

*Gloucester*, the gallant scout, watches the south exit of Messine, ready to shadow the Germans.

The Kaiser has just forwarded his send-off (5:00 P. M.) expecting that the ships would safely get through.

*Goeben* and *Breslau* sail southerly at the sounds of "*L'Allemagne au-dessous de tout!*" Just out they fall on the *Gloucester*! Are the British forces close behind this scout, or are they miles away? In fact, *Gloucester* screens nothing. I cannot tell, with certainty, where the three battle cruisers were lying or cruising.

*Goeben* takes its course South, then East, afterwards northeast. And the while *Gloucester* is left able to report what he likes to the British admirals (Milne and Troubridge) about the Germans' motions.

Admiral Troubridge sticks to his watch. As he was ordered, *he will not prematurely engage any action with the "Goeben," which he considers a stronger force than that of his armoured cruisers, stronger in speed, armament and protection.* So, whatever *Gloucester* may report he will not move, but maintains his watch against eventual Austrian raiders, and faces the *Goeben*, only if he is compelled to.

10:00 P. M.—the Germans were closing the Canal of Otrante when Admiral Souchon played his second trick in turning from northeast to southeast thus heading for Cape Matapan instead of the Adriatic.

This move does not pass unnoticed by *Gloucester*, who follows endeavouring to send reports to the British admirals and succeeding the task, although the efforts are made by the Germans to meddle his radios.

Admiral Milne does not appear, his battleships being apparently still coaling. Admiral Troubridge, sticking strictly to his orders, takes no step to follow the Germans. (Later he was tried by a martial court and was "*fully and honourably acquitted*," his conduct being blameless).

So, the Germans are at large, only shadowed by a tiny brave scout.

#### EVENTS OF THE SEVENTH OF AUGUST

Early in the morning the little British *David* launches a torpedo at the *Breslau* and misses the hit but by a few yards. Then this *David* tries shelling the same. But the German *Goliath* (the *Goëben*) turns towards the British *David*, which has nothing left but to make its retreat.

Reaching the Cape Matapan the Germans meet a collier and order its captain to go to, and take the anchorage near a small island called Denusa.

The German liner *General*, who has followed, is sent to Smyrne where its radio apparatus will constitute a "relay" to reach Constantinople by German means.

#### EVENTS OF THE EIGHTH OF AUGUST

The *Goëben* and *Breslau* are coaling at Denusa. The *General* has reached Smyrne. Admiral Souchon is, now, in direct communication with Constantinople. A secret treaty, it is said, had since the fourth, been agreed upon between Germans and Turks. But, as in a comedy, the passage through the Dardanelles is still refused to the Germans.

The French ships, some thousand miles away, are out of question. As for the British, who might have been close by, they are seen or heard nowhere. But the hope is that they will rally without notice.

#### EVENTS OF THE NINTH OF AUGUST

The coaling is finished. To prolong stay at Denusa would be dangerous. Admiral Souchon having, himself, a good knowledge of the Straits, and of the position of the mines previously laid by the Turks, while they are at war with Italy, decides to sail for Constantinople.

#### EVENTS OF THE TENTH OF AUGUST

5:00 P. M.—*Goëben* and *Breslau*, reaching the Dardanelles, ask for a pilot. A small steamer comes ahead of them and, taking the lead, signals: "*Follow Me!*"

9:00 P. M.—The British forces arrive at last. But the night has then fallen. The entrance is refused, once and for all!

Somebody has written that *Nelson*, *Farragut*, or *Suffren*, would have forced through the passage. But, at their time, they were left entirely to themselves. There was no radio apparatus, and no Government behind, instantly able to mark its will. (*I think Admiral Sims would have forced through.*)

The defensive spirit born out of the submarine warfare mystery, and which spread, so unhappily, from the admiralities to some naval chiefs, was unknown at the time of these great men.

The fact is that the success of the German admiral was complete. He had fully realized the Kaiser's wish to place a German at the head of the Turkish navy.

The refusal openly made to the numerous calls of Souchon to be admitted at Constantinople, was a third trick of this admiral, to make the Allies believe that the German cruisers would be compelled to return back to the West and make their ships slack their speed during their easterly course.

The God of War was not, then, with the Entente.

It is a great pity that the *Goeben* should have been allowed to escape, for the war would probably have lasted but a few months, had it been captured. The end would have come without the whole of Europe's being set afire, and some greedy land hungers would not have appeared on the stage. People who are now enemies would still live in peace, and millions of lives should have been preserved. Misery and failure of nations would have been unknown.

But if really the length of the war should have been lessened, had the Mediterranean fleet succeeded in arresting the *Goeben* and *Breslau*, and if this unhappy fact is imputable to some one, who is to blame?

Some people may say: *FATALITY!* But no sailor will admit such a reason.

Some French accused the French commander.

Numerous British believed in Admiral Troubridge's neglect. Among people of both nations, many wondered why no information appeared, nowhere, about the whereabouts of Admiral Milne's battle cruisers, from the sixth to the tenth of August 1914.

On his side, the man in the street wondered how some fifty ships could, thus, have missed two. For Admiral Troubridge, who deliberately decided not to follow the Germans while they were very close to his armoured cruisers, and while he knew perfectly well where they were and what course they followed, a Martial court has decided "*not guilty*" in acquitting him "*fully and honourably*."

For the French commander, who, between the early fourth and the sixth, in the afternoon by every information was made to believe that the enemy was in the Western Mediterranean, who



was responsible for the French shores, ships, men of war and troops, is there any blame whatever?

For the British commander I possess no accurate information as to his whereabouts. A few months ago the *Daily Mail* and the *Times*, if I am not mistaken, announced the imminent issue of a full account of the operations that had taken place on Admiral Milne's side.

But in reality the blame does not rest only on the sea actors' shoulders. The *spirit of defensive* which prevailed previous to the war, and at its breaking, had taken its origin in the midst of the Admiralty.

The memorandum of Admiral Jellicoe, about his intended policy against an enemy, the Admiralty's approval of this document, the order of the Admiralty to Admiral Milne not to face prematurely a stronger force, prove abundantly the defensive spirit which handicapped any naval success.

As for the French they entertained no defensive spirit. But there was a lack of preparedness unbelievable: France possessed no battle cruisers nor any scout. The range of the artillery was quite insufficient. No ship was equipped with the fire control director. As for the air forces they were next to *nil* in August, 1914.

*Unpreparedness* had deprived the French chiefs of the very means indispensable to back a fighting spirit. *Hares cannot be hunted with turtles*. France Admiralty had forgotten what *armament, speed* and *protection* were.

The informations given to the French commander were often worded without the necessary care: *hours, situations* were, sometimes, omitted, as the reader has certainly noticed in perusing my modest contribution to put some light on the case of the *Goëben's* escape.



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## THE STRATEGY DEPARTMENT OF THE WAR COLLEGE

A LECTURE FOR THE OFFICERS OF THE UNITED STATES ATLANTIC  
FLEET\*

BY CAPTAIN REGINALD R. BELKNAP, U. S. N.

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The Department of Strategy of the War College includes the subjects of international law,† policy, strategy, and logistics, together with the concrete application of strategy in chart maneuvers.

### INTERNATIONAL LAW

With international law in its fundamentals all naval officers are familiar, through study at the Naval Academy and preparation for examination. The subject is one in which all officers should be well grounded, particularly those who may come to command. Others, too, should be well informed and all may be assured of finding their interest increase the more they become versed in it.

The navy's principal and normal field is international, the navy being a powerful agency in the diplomacy of peace as well as of war. The ordinary course of cruising brings officers into situations where they must decide whether to act or to refrain, and if to act, what to do, how far to go. The decision, to be correct and suitable, must be founded upon a good grasp of law and precedent as they apply to the immediate circumstances. With the knowledge and cultivated judgment derived from consistent preparation, an officer may meet such situations with confidence. One hears much and often how the cable and radio have lessened the responsibility and discretion of ministers and naval commanders abroad, but let us not be deceived by any such misleading idea. In the first place, international relations have become much more

\* Delivered September 8, 1921.

† Since this was written, International Law has become a separate department, as formerly.

complex partly through these very means of rapid communication. But besides that, cable and radio messages do not always pass quickly. At headquarters at home they may cut only a small figure in the day's business there, and the instructions sent to you may be so general or so apparently in conflict with needs or facts as you see them as to tax all your powers to conform.

Four times in the Boxer troubles the American admiral had to act without guidance from the Government. Not long ago in the Caribbean, a gunboat commander had to take a decisive stand on a doubtful question on the spur of the moment. On the retirement of an American admiral some ten years ago, he was at the instance of the State Department especially commended for the sagacity and insight of his reports during a trying period in China. Instances could be multiplied, and no matter what may be the future development of quick communication, the man on the spot must always be a great factor. Merely to report a situation intelligently, he must be able to comprehend it himself; how much more is required when he is called upon to act. And when he goes into a conference, if he is to play a worthy part there, he must be well grounded, well prepared.

It is inspiring to know our traditions and a word as to the achievements of our forbears may not be out of place. The War College walls bear a placard containing the tribute of two eminent statesmen to the naval officer as a diplomatist. In 1898, in London, Lord Salisbury, the British prime minister and secretary for foreign affairs, said that the promise of Europe to the Cretan people that they should have autonomy under the suzerainty of the Sultan, a problem of great difficulty, owed its fulfillment to the admirals of the international fleet, by their development in a very remarkable degree of the powers of diplomacy and government. And during the winter of 1902-3, apropos of a revolutionary situation existing in the Caribbean, Mr. John Hay, secretary of state, remarked to President Roosevelt: "I always feel relieved when the naval officer arrives on the scene because he always keeps within the situation." Two years later, Mr. Hay said to Rear Admiral Chadwick, then president of the War College: "We have had a number of difficult international situations in the West Indies and Venezuela in the past two years and

they have all been handled by naval officers very well. They have not made a single mistake."

There you have extreme instances of the various situations where a naval officer may have to act—from guarding a consulate during local disorder to joint operations in a complicated matter of far-reaching effect. And there is another high plane where likewise our officers have borne great responsibility with credit—in advising the State Department on neutrality matters during the late war, and in being delegates to the great international conferences in recent years at The Hague and in London. Such is our background, such is the record of accomplishment and trustworthiness which officers of the present day have to uphold and continue.

The War College course enlarges our earlier study of international law by a course of lectures and by study and discussion of special topics, all conducted by Professor George Grafton Wilson. For many years, also, the War College has issued to the service, annually, a publication of one or more topics of international law, valuable for information and reference and often of absorbing interest.

#### POLICY

The study of international law shows at the outset that the international community of nations differs radically from the domestic community of individuals in that no superior authority exists to enforce the compliance of a nation. As the earliest activities of individuals grew and expanded, the need arose for some regulation of them, and so government was instituted, to the end that causes of conflict in the community might be avoided, individual rights as well as common rights protected, the general welfare promoted, and differences that were otherwise irreconcilable might be settled by judgment, with compulsory compliance. Among the individuals of a nation the power of government prevails over conflicting interests, but among the members of the world community, a superior power disposing of the means to compel a nation does not exist, so that any conflict of interests between nations must be settled by agreement or by preponderance of force. A nation's activities have in the end to conform only to natural law, and as this law is not codified nor always

determinable, and as nations do not knowingly embark on a course leading to war unnecessarily, the Government has need to be well informed about other nations. All are in the field together, claiming equal right, with no restraint other than voluntary agreement by treaty, the moral influence of international law, and the limitations of their own powers.

Strictly speaking, other nations are concerned only with our external affairs, but in these days of wide and growing international communication and intermingling in matters of all kinds, it becomes more and more difficult to draw the line between what is external, what internal. The separate jurisdictions of national and of state laws in this country, for instance, have on more than one occasion brought matters which seemed to be exclusively domestic into considerable diplomatic prominence. The lynching of some Italians in New Orleans in 1888, and the more recent Japanese school question in California, are cases in point. So also with a new industry whose product is at first wholly absorbed by internal demand. When it expands and enters the export field, it comes into competition with other nations and affects their economics. Thus, as a nation's activities grow, other nations become more and more concerned in them, with the possibility of conflicting interests in the future.

Racial origin and temperament, geographical location and configuration, natural resources, and political and social organization are the most powerful factors in determining the course and destiny of a nation. These fundamentals are either unalterable or else so deep-rooted as to be susceptible of change only gradually. Their combined effect is so compelling that, while contrary action may retard or for a time divert a nation's natural development, irrepressible natural forces will in the end prevail. This is the meaning implied in the term "manifest destiny," examples of which are found in our own history. Thus, the manhood and enterprise of our settlers west of the Alleghenies made it impossible for the great outlet of that region, the Mississippi, to continue under alien control. Later, the powerful cohesive tendencies of common race, temperament, history, territory, and intersectional interests have, in spite of prolonged and bitter civil war and its aftermath, solidified our people as one nation. Likewise in Germany and in Italy, the many small states kept apart

for years by artificial means finally overcame the separative obstacles and then these countries became solidified into the powerful nations of their destiny. Thus men, races, and nations are creatures of the forces of nature, which can be guided, governed, and developed, or for a time restrained, but essentially altered only slowly.

Policy, sound national policy, may be defined as a practical, wise course of action contributing to the nation's welfare, and it is evident that to shape a nation's foreign policy is not a matter of free choosing but rather the discernment of the natural causes which underlie the national interest in question. And in every case the policy framer must take into account the other nations that may be affected. The Government must consider whither a contemplated policy may lead, and as there is no superior control, the guiding, and if necessary restraining, function must be exercised by policy, which is a form of national self-control. And so, before settling on a policy the Government should examine into the probable causes of conflict with the interests of other nations, the importance of those interests to the foreign nations concerned, the probability of their opposition leading to a resort to arms, the interests of third parties that may be affected and their probable attitude, and, in the event of war, whether our means are sufficient to insure success, the cost of such a settlement, and the net result in gain or loss—not from the material standpoint but gain or loss to the nation in its world position.

Upon such an investigation, a Government could always proceed with confidence were it not that popular support is necessary. The problem is complicated by the fact that popular majorities consist largely of those who are not well enough informed to decide intelligently what the nation's policy should be. They expect the policy pursued to be appropriate and stoutly maintained even without the requisite force to rely upon, this difference between what should be and what is making the statesman's task more difficult, calling for knowledge and skill of the highest order.

To shape and pursue a successful policy is thus a higher art than mere governing, since it is the art of governing to advantage in competition with other nations. Education and training in administration might suffice for mere government, but the main-

tenance of sound policy requires a knowledge of the world, past and present, and such knowledge should include an intelligent grasp of the function of the military branch of the government. As Spenser Wilkinson says:

The policy of a nation must of course bear some relation to its strength, which depends upon its resources and the excellence of its administration, but the strength with which a foreign minister is more immediately concerned is that of the army and navy. (*War and Policy*, p. 8.)

The military branch must not be a thing detached, to be thought of only when war is imminent. The country's readiness to meet a forcible challenge of its foreign policy should always be kept in mind, and the statesman, as far as he can bring it about, should maintain the nation's military preparation in strength and character appropriate to the support of the nation's policy. The German army and the British navy are striking examples of this principle. What it is in the nation's interest that the nation's military power may have to contend for can be answered only by the statesman. He more than any other is concerned in there being military power ready and adequate for any probable needs, for this is provision against forcible interference with the nation's lawful rights, lawful by nature. What those rights are and where, by whom, and when they may be forcibly contested are questions for the statesman. If any probable development of the national activity is likely to encounter greater opposition of force than there is military power to overcome, the course of prudence is to divert those activities into other channels or, if that cannot be done, if the activities are essentially right and just for the nation and especially if they arise from strong natural impulse, then they should be restrained until the requisite military backing has been prepared.

The United States has from time to time held policies of direct effect on affairs of foreign nations. Our earlier shipping policy fostered the American merchant marine at considerable loss to foreign carriers. Our tariff policy has varied considerably, each change affecting foreign industries and commerce, sometimes to their advantage, sometimes to their loss, but always necessitating some readjustment. Others of our policies have long stood without material change, such as the Monroe Doctrine and Asiatic



Exclusion. Of late years, the Open Door policy in the Far East has come to the front and as this bears not only on trade but also on the integrity of China, the matter has acquired broad proportions, requiring deep, far-seeing consideration.

Policy is studied in the War College by reading, lectures, and in writing of theses. Reading and consideration of policy continue throughout the course, being inseparable from the proper study of other subjects. The solution of problems brings out effects of various policies and reveals possibilities, desirabilities, or the actual existence of policy in the making, which throw additional light on our own interests and policies.

### STRATEGY

How to determine the military power that may be necessary to uphold a given policy against challenge brings us into the field of strategy. Policy and strategy look to the same end, strategy answering the question how to do what policy requires in case of resort to arms. Policy aims to attain its object peacefully, if possible, but when that object is important enough to fight for, the means to attain it change from the milder form employed in peace to the stronger form of war. The object in view remains the same. Thus, war is the continuation of policy by the strongest means.

The Monroe Doctrine, for example, indicates the means to preserve from hindrance the development of the principles of living which brought about the predominance in America of the Anglo-Saxon race. The same result might have been achieved or at least aimed at by other means but the exclusion of foreign control is undoubtedly the surest course to maintain American ideas in the ascendant in this hemisphere. It guards against possible trouble growing by preventing any seed from being planted. This doctrine we have more than once upheld with more vigor than usual in diplomatic dealings. After the Civil War, France was given to understand that her forces and interference in Mexico must be withdrawn. In 1895, over the boundary dispute between Venezuela and Great Britain, this country declared an attitude of grave concern unless Great Britain should agree to arbitrate. In the Mexican case we were strong enough to compel the compliance of France, but in the latter case we were

far from strong enough to coerce Great Britain by arms. It was probably estimated by both parties, however, that the friendship of the United States was of more value to Great Britain than any gain in Venezuela—and she acceded. Thus, in serving the national aim—to grow according to our own ideals, free from alien interference or menace—the Monroe Doctrine formulates a strategic decision expressive of national attitude and action. Hands off or we fight. So considered, the necessity becomes evident to study the strategy involved, the means to give effect to the Monroe Doctrine.

In studying any questions touching exterior interests, it is imperative to know the possibilities of conflict and opposition, the consequent demands and the resources to meet them. In cases where there may be more than one course of political action open, the strategy involved by each course under consideration should exert strong influence upon the final choice of policy. Where, on the other hand, the formulated policy is forced upon the government by deep-lying popular feeling, as in the case of Asiatic Exclusion, the strategy involved by that policy should receive the early and careful attention of the highest statesmen. Strategy is thus the "look" before the "leap" of policy, but where policy exudes in crude form from the popular will, strategy comes as an afterthought, with the extra risks, difficulties, and costs usually attendant on afterthoughts.

Strategy in its highest sphere determines where, to what extent, and for what specific purpose military force shall be employed or manifested in pursuance of the nation's policies. This lies in the province of the national headquarters—with the President and Cabinet. The weighing of the risks and costs of national action, contemplated or already undertaken, must be followed by decision and commensurate preparation, lest the result be all cost with failure. Here there must be mutual working of political and military considerations. Statesmen must take military considerations into full account in their deliberations on exterior affairs, and reciprocally, military authorities, in executing military operations and advising on large military questions, must comprehend the political significance of their undertakings. Nothing could be more misleading or more liable to miscarry a large operation than to advise or to act "from the purely naval point

of view," as if it were or could be a thing apart. On this account, no directive body can wisely govern without military counsel of the highest order, and no military commander can succeed without understanding the end in view, political as well as military. Corbett states two vital principles in making war—one is the importance of admirals fully understanding the political significance of their orders and the other, the importance at headquarters of familiarity with the elementary principles of strategy.

The Army and Navy Departments of the government take the decisions of higher strategy as military policies to be carried out. Higher strategy may decide that to uphold the Monroe Doctrine we must be supreme in the Caribbean. And to control the Panama Canal we must be supreme in the Caribbean. And to be prepared against resistance to Asiatic Exclusion we must hold Hawaii, to do which (until Pacific Coast bases are adequate) means holding the Canal, and hence supremacy in the Caribbean. Thus, holding the Caribbean, the Canal, and Hawaii, are determined as cardinal military policies, and the requisite means for their achievement are worked out in the sphere of military strategy, by the War and Navy Departments.

Military strategy must take account of all elements affecting the international difficulties that may possibly develop. Not only our own policies but also those of other nations point where to look for possible trouble. The effect of these policies on the international situation as a whole is the true criterion by which to measure the military effort necessary to prepare. Mere numerical superiority in the theater of operations against an enemy is an insecure standard unless complications or pressure in other quarters are adequately provided for. Bismarck was careful to insure the neutrality of other nations before the wars of Prussia against Denmark, Austria, and France. When the Monroe Doctrine was promulgated, this country was in no condition to maintain it if challenged, but the international situation sustained it. Again, when the French violated that doctrine by going into Mexico, we were too occupied to resist with force until the Civil War was over.

A firm grasp of the true nature of the national purpose is necessary to determine where and how military effort will be effective.

The basic principle of successful strategy is concentration of all effort, high and low, on the end in view. Concentration demands the right kind of effort—whether a strong and vigorous offensive, to strike hard and quick before the enemy is in full strength, to deny him time and opportunity to concentrate and complete his preparation and defense; or a defensive course, to gain time ourselves, to wear the enemy down or to put upon him greater effort; or the mixed form of offensive-defensive, to hold what we have, harass the enemy, break up his combinations, and so wear away his power to continue.

An offensive course, for instance, may fail where a defensive attitude would have easily succeeded. Corbett derives a principle from Admiral Byng's unfortunate experience. "Better than taking the offensive yourself is to force the offensive upon an enemy who is too weak for it." These two principles marked the general course of the British grand fleet in the late war. The German fleet could do no great harm while confined to its own coast. For the British fleet to have gone in after them would have been very costly and probably disastrous. By not doing so but instead maintaining a position in readiness to rout the Germans, the offensive was forced upon the weaker German fleet, should it attempt more than guard its own coast. Mahan writes: "In war the defensive exists mainly that the offensive may act more freely." Trained judgment will perceive the course which tends most for concentration of effort towards the main purpose.

The degree of force and the kind and theater of its operations having been determined, in pursuance of the national policies, the next step in strategy is to prepare the force and the supports for its employment. These preparations include plans, personnel, training, material, bases, and supplies. In our War College studies, problems in strategy are based on an assumed general situation which is known to both sides and a special situation for each side known only to that side. These problems are made as realistic and as true to possibilities as permitted by the data at hand derived from experience. The qualities of existing types of vessels and weapons and the strength and composition of existing fleets are used. In this way the problems serve to develop, along with understanding the principles of the art of war, facility in applying them to the forces of the present day. These studies

sometimes bring out the desirability of new or modified types or greater numbers of existing types, or other apparent improvements, and the problems afford a ready means of testing such proposals before laying out money on actual experiment in service.

Plans for operations lead directly to the consideration of building programs and repair and docking facilities, to the supply and training of personnel, the maintenance and training and mobilization of reserves, to the establishment, security and stocking of bases, and to the acquirement and transport of supplies. This leads us into the sphere of logistics.

### LOGISTICS

By the term logistics is meant the moving, supplying, and refitting of the fleet in the best order and security. The two prime requisites of military force are power and mobility. Power does not vary, assuming proper upkeep, but the means for mobility consume away. The mobility of a naval force is perfect *for a time*, but that is limited by the fuel radius. A force is *productive* in a military sense only while it is employed actively against the enemy, and the larger *the proportion* of the whole force that is actively employed at one time, compared to the time spent and the strength kept idle while refitting, the *greater is the efficiency* of the logistics. To save a day in the turn-around of a supply ship may seem a small matter, but multiply that by the whole number of supply ships employed and we save one or two whole convoys, thereby reducing the amount of escort duty to be done and correspondingly increasing the force available at the front. Hence, any increase in skill and pains applied to logistics is felt directly at the front, through enabling *more force* to press actively on the enemy.

The logistic requirements for war vary according to the location of the principal operations. The elements influencing such variations are:

- (a) The distance of the theater of operations from the home coast;
- (b) The possession of secure advanced bases;
- (c) The availability of positions suitable for advanced bases;

- (d) The direction and distance of sources of supply;
- (e) The material resources of the belligerent's own country;
- (f) The number and location of available lines of communication;
- (g) The degree of preparation existing during peace.

The elements of the enemy's logistics also influence our own, because his facility or difficulty of operating calls for greater or less effort to overcome him, thus affecting our logistics indirectly but surely.

No proper grasp can be had of the large problems of strategy until one has examined into the logistics involved in one of them. Not alone fuel, water, food, and clothing, but also general stores, base equipment, repair ships, hospital ships, ammunition ships, tenders of various kinds, sweepers, surveying vessels, patrol vessels, and troop transports—all may have to be provided for, prepared, organized, grouped, assembled, routed, turned around, and got back home for another load. It is a vast undertaking to maintain a large force overseas—in one problem 30,000 tons of shipping required to arrive every day.

The study of problems in support of national policies brings out requirements and existing deficiencies. It shows the need of bases, the need to acquire them and make them secure during peace. From a salient base already in possession, the fleet may at once, by an active course, prevent or neutralize the gain which would otherwise accrue to the enemy through delay on our part, if we first had to obtain a base—with all the attendant hurried effort and loss of time in preparing an expedition, with possible neutrality complications and exposure to enemy attack while seizing the base.

A military force is supported by its communications, which Mahan calls "the living connection with the national power." When the arteries are sound, activity may be daring and of robust vigor, but when the life channel is precarious, activity is gripped by invalidism. For communications to be reliable, the bases must be secure, and unless their security is independent of the presence of the fleet, the fleet is half paralyzed. "A fleet charged with the care of its base is a fleet by so far weakened for effective action—weakened both strategically and tactically." Insecurity of the

base is as fatal to vigor as a weakness of the heart. The fate of Port Arthur and of the Russian fleet based on it is a terrible example.

Our own fleet made a notable long distance cruise around the world in 1907-09, with resultant influence on the subsequent development of a train. Another cardinal practice of ours, self- upkeep and self-repair of ships in the fleet, is of the greatest value. These are long steps towards good logistics in war, but the study of logistics shows that these are only the beginning, and that the problem which might confront us in war would demand the utmost of every officer in keeping his weapons bright. All will do this the more surely through some effort on their own part to understand its meaning to the nation.

### CONCLUSION

From the foregoing outline it is seen how international law, policy, strategy, and logistics are woven together in one great study for the welfare of the nation. By reading history, biography, and books on the large problems and prominent topics of the world's life, one acquires the power to see events in their real significance and to form sound opinions of one's own. The college courses and other exercises conjointly with other officers, point the way and help to keep one on the right track yet not in a rut, but most of all must officers depend upon their own efforts, keeping in mind the purpose of all our training and effort—that the naval commander and the naval force, in every way and every situation, shall be equal to the task.

The great names of naval history were men of large general information and knowing insight in international affairs—St. Vincent, Rodney, Nelson, Farragut, to mention only a few. Nowhere does "knowledge is power" apply stronger than in the navy, and it is obvious that the power of the leader to act to best advantage is greatly enhanced by broad-minded, well-informed grasp of the situation by his subordinates.

Rear Admiral H. C. Taylor, an early president of the War College, an officer of wide reading and experience, recommended young officers to read Mahan again and again, adding, "put it under your pillow." In a recent number of the NAVAL INSTITUTE, our Vice Admiral Knapp urges officers to acquire the international

outlook. Only reading and study will lead to that, with real intent to read, mark, learn, and inwardly digest—the reflective kind of reading, which stocks the mind with information and develops the ability to apply it. Officers who form this habit of serious reading find it refreshing as well as profitable. By means of it you will surely advance yourself towards real fitness for that occasion when the situation may suddenly tax your utmost abilities. Then, if prepared, you may demonstrate, with the world looking on, that indeed, knowledge is power.



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## A FIGHTING LEADER FOR THE FLEET

BY LIEUT. COMMANDER R. K. TURNER, U. S. NAVY

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Napoleon postponed his visit to England until July, 1815, because he was not possessed of the "seaman's eye." A correct view of the way to Britain from the continent cannot be gained by a man who has confined his activities to shore, since it leads across a bit of water whose management is only possible to one familiar with ship and the sea. The genius who reorganized France during the Hundred Days was unable to effect a combination to baffle the storm-tossed Nelson; to control Nelson's element required, not a Napoleon, but a greater Nelson. Had Napoleon been an admiral he would have succeeded in reaching England, but his success would have been gained with the methods of a seaman and not with those of a soldier.

Those who spend their lives on shore are not fitted to solve the problems of the sea, since at sea through countless years have grown up certain customs in the conduct of affairs; the results of necessity, that are quite different from those obtaining in analogous situations ashore. The seafaring man has, in fact, methods of his own for accomplishing his ends that are peculiar to the sea and for which methods suitable enough for work on land cannot be substituted without detriment. These customs, these methods, exist alike for the prosecution of warfare as for the business of peace.

The principles of war are few, easily learned, and correctly put into practice with only the greatest difficulty. These principles apply equally to war on the land, in the air, on the water, and under the water and even their correct application in the most widely different circumstances does not change as regards men

*Note.* This article was written in October, 1921.

but only as regards changed weapons and conditions. Thus warfare on land and sea today is, except in details, like it was in the days of Hannibal and when Antony fled from Actium to his doom. But the detailed application at sea of the few great truths of warfare differs from their application ashore, and largely because the vastly superior means that exist at sea for transporting the fighting forces and the resulting speed with which unexpected situations develop requires leadership to be exercised in an entirely different manner in the conduct of the affairs of fleets than in the direction of those of armies. The tradition of the sea is the fighting leader commanding the fleet from a fighting ship and exercising a personal control whether of strategical operations or tactical movements in battle that has in the case of shore forces necessarily been delegated to subordinates by the general in command. Napoleon from the shore at Boulogne attempting to effect, with the same methods, the concentration of an army and a fleet, and from a position distant from this fleet essaying the exact direction of its movements, displays his lack of appreciation of the correct use of that weapon. Because his unfamiliarity with the sea made him fail to realize the importance of the element of personal command by his admirals, the greatest soldier of the age could not, in two years' time, absolute master of the continent as he was, cross the twenty wet miles of Britain's frontier.

Successful war at sea has in the past been waged by seamen with seamen's methods; in the future seamanlike methods will gain like results. The study by seamen of war rightly includes both land war and sea war, but while our libraries abound with books on land warfare, from strategy through tactics to detailed organizations of staffs and the varied forces, we have but the bare outlines of accomplishment recorded for the sea warriors. Even Mahan's writings, dealing almost solely with strategical considerations, throw us on our own resources as regards tactics and organization. Therefore we turn to the many German and other writings on staff activity and training, and hunt through voluminous reports and charts of the late war in the course of study. Not content with the British system, since, in the only sea battle of first importance, it (or something) failed to produce satisfactory results even with overwhelming forces, we attempt to adapt the devices of the soldier to the solution of the problems of the

sailor. Rather should their solution be guided by sound thought and by study of the battles of former masters of the sea. Nor may we blindly accept their methods where these are susceptible of improvement; on the contrary they must undergo such modification as experience shows will give effective results. But we must take care that in hasty change we do not discard any of the *fundamentals* of three thousand years of practical war.

One of the changes that is popular at the moment concerns an increase in staff functions and the centralization of detailed staff control under the personal direction of the commander-in-chief. Under this plan that officer is relieved of direct command of any part of his fleet. Following adoption of the German method we have seen the armies of the world transformed by staff control into closely knit organizations having an efficiency undreamed of a few years ago; it is inevitable that there should be an increasing agitation to extend this system to the navy in order to gain the same benefits that have accrued to the army.

It is certain most naval officers feel a hearty sympathy with any agitation which will assist in creating the centralized authority and decentralized initiative that will win battles. There is one phase of this movement, however, that contemplates a change savoring too much of the camp and too little of the quarterdeck. Doubtless it is the example set by the German Great Headquarters Staff that is responsible for the recurrent demand for a special flagship for the admiral, which shall be devoted wholly to his service. This demand is not entirely new, and at one time in the recent past there was wide discussion of the tentative plan for a heavily armored, practically gun-less vessel for the purpose of carrying the flag at all times, even during battle. At the present time we hear no more of this plan because of the wave of economy as regards military matters, but instead we behold the admiral of the United States fleet embarked upon an unarmored, practically unarmed vessel, the *Columbia*!

The *Columbia*, formerly an army transport, and not designed for her new use, is designated as the "Administrative Flagship" of the fleet, while the *Maryland*, the newest and most powerful of our battleships, is termed the "Tactical Flagship." The latter, when the admiral is not embarked on board, will take her place as one of the units of a division for ordinary tactical and admin-

istrative purposes. The present view as to the employment of the *Columbia* may then be presumed to be that under normal conditions of peace, and for about nine-tenths of the time, the commander-in-chief and his staff will perform their functions on board that vessel. During combined maneuvers, both in peace and war, the admiral, with a certain number of his staff, will take up his station on the *Maryland*. With this scheme it is obvious that the *Columbia* is not likely to be used in war as a tactical flagship, if only because of her vulnerability to attack while at sea.

In any discussion of this matter we can not ignore, however, the former opinions of many members of the service who felt that experience and study showed the desirability of the above-mentioned heavily armored and gun-less flagship for the use of the admiral in the actual tactical direction of battle. It appears that the idea back of the present administrative flagship, the *Columbia*, is a development of the previous scheme, and doubtless we may expect to see, during maneuvers, that vessel occasionally used as the tactical flagship if only for the purpose of demonstrating how a battle may be conducted from a ship not engaged in fighting. If such a demonstration shows promising results it is more than possible that the old agitation for a combined administrative and tactical non-combatant flagship may be renewed. Therefore in any discussion of the present "Two Flagship" system we should at the same time go into the older question of whether or not a special tactical flagship would increase the efficiency of operation of the fleet during war.

The reasons that influence those favoring either the "Special Flagship" or the "Two Flagship" system may be grouped together as follows:

(a) The existence of the varied forces of modern warfare requires that the commander be in such a tactical position as will allow him to give consideration to all, and not alone to the battleships. It is argued that the admiral, embarked on a battleship in the line, sees only the ships about him and loses touch with the cruiser force, the destroyers, the submarines, and the aircraft.

(b) The smoke and noise interfere with the transmission of signals. It is said that a ship behind the line can send signals with greater certainty than if in the line itself. In addition, it is

assumed that signals can more easily be exchanged with the other forces.

(c) The admiral, since his ship is neither firing nor is close to other ships that are firing, can, it is said, gain a better view of his own and the enemy's line and thus be better informed as to the tactical situation.

(d) Since a battleship is built for the definite purpose of fighting and must carry a full complement for ship operation there is insufficient space for a staff as large as desired; both the staff and ship facilities are thus improperly reduced. With a ship built only for the admiral all the staff functions, now sometimes either curtailed or performed in other ships, can be collected and a thoroughly efficient organization provided.

(e) In peace, or while the flagship, if a battleship, is cruising for primary training, both the ship and staff are unavoidably hampered by the necessary duties of the other.

(f) During peace, or in war when operations cover a wide area, the admiral must be able to inspect and supervise the work of scattered forces by paying personal visits to all units. He must not be tied down to the battleships alone, but it must be possible for him to be absent from his major forces for weeks or even months; it is necessary, therefore, for him to have such a vessel as will carry his entire staff.

It would seem that the recital of these arguments would indicate answers sufficiently powerful to defeat the whole project. Such has not, however, been the case, since, although the original idea of the special tactical flagship has been abandoned, the compromise represented by the *Columbia* has been accepted. Before combating these arguments put forth to support a device copied from the headquarters organization of the land forces, it will be well to examine more fully into some of the essential differences between the problems confronted on land and at sea, in order to appreciate the very good grounds that exist for the differences between the organizations as they have been up to the present:

In the first place, land battles are local, their movements and developments taking place very slowly, while at sea an action is fought at full speed, miles are covered in a few minutes, and the trend of success or failure develops very suddenly. The

time element at sea is of so much greater importance that it cannot be too greatly emphasized. No fire superiority on land, except in case of complete surprise, can possibly be so great that the action may be decided by it alone within a few minutes. At sea, five or ten minutes' decisive fire superiority may well mean a great victory. The admiral must estimate a situation, decide upon his action, and see to its execution, all within a very few minutes; under such circumstances it is upon his own judgment of the moment that he must rely, a judgment comparatively uninfluenced by staff or subordinate advice, but formed instantly as a result of personal observation, previous study, and experience.

The amount of staff direction prior to or during combat, so necessary on shore, is not required at sea. Land battles on a great scale often occur after weeks of planning in great detail for the tactical use of an army over a particular and well known terrain. The conditions most likely to develop are assumed, special plans are made to meet them, and the result often depends upon close adherence to plan and the correct use of a large tactical reserve. For this reserve particular arrangements must be made both before and during battle. At sea there is no tactical reserve under ordinary circumstances and after the battle is joined: both admirals endeavor at the earliest moment to bring their full force to bear. Nor can the exact locality of the action be known far ahead of time, nor the direction, the formation, the course, nor the strength of the enemy; the battle must be fought under the influence of a general and flexible doctrine supplemented by maneuver orders only. No such thing as the definitely fixed and co-ordinated plan of the army, requiring staff work on a large scale, will ever exist for the navy. The movement to the battle line of new troops, supplies, and ammunition does not take place at sea while the fight continues because they are already present and so this matter requires no special battle orders. Even admitting that it is necessary to enlarge the scope of naval staff work, it is difficult to see how it can ever reach the proportions to which some persons, impressed with the army organization, believe it should grow.

The modern battle lines ashore that extend for many miles in front and depth owe their existence to the development of rapid

communication secure from interruption. The commander-in-chief is in touch with all parts of his army through his headquarters organization, and his battle decisions, made after a study of many reports and recommendations from his subordinate commanders and staff, are made from a view of the map alone—a personal view of the battle may even lead to false conclusions, since the whole field cannot be seen by one man. This personal view of a sea battle is admittedly the first essential for an admiral, and the many tactical decisions he makes are necessarily the results chiefly of impressions rather than a long series of information reports. Such reports are fragmentary and slow in reaching their destination because of the meagre means for communication, subject, as it is, to constant interruption. The transmission of information, while of vast importance, is notoriously unreliable and can never keep pace, in rapidity, with the development of the action and the necessity for quick decision.

One need have little discernment in reading history to note that the more or less flexible command exercised by the commander-in-chief of land operations is entirely different from the very close personal command of engaged forces exercised by an admiral commanding a fleet. This characteristic difference in the past must not be ignored because very good reasons require the use of each method in its own place. This is not to say that great sea battles have not been fought when the commander-in-chief was not present, but in such circumstances the supreme command of the action has been out of the hands of the commander-in-chief and the entire responsibility, initiative, and execution have been with the commander actually with the fleet. We cannot alter the fact that the commander at sea has always been the fighting leader. The most notorious case in history of a commander-in-chief in a flagship separate from but near the battle resulted in fresh laurels to Nelson at Copenhagen. Here the fighting leader was, as always, in the thick of the fight, and the name of Sir Hyde Parker, his commander, is forgotten because of his small influence upon the event. Nelson invariably planned his actions to win and wished always to be on the best fighting ship and in the thickest of the fray where he knew victory was to be found. At Trafalgar he was urged to hold his flagship back from the fight; he had a splendid opportunity

to remain on a fast sailing frigate out of the line and thence to direct the battle. He chose instead to lead the left column straight for the enemy's center because he was a fighting and not a non-combatant admiral.

The answers to the arguments for a special flagship thus suggest themselves. As to (a), the reason the admiral places himself on board a battleship is because the battleship force, combining both infantry and artillery, with ability to take and give hard knocks, is the force which wins the victory. These vessels will always be at the tactically important center of the action, and it is essential that the admiral, whose decisions necessarily flow largely from a personal view of the action, must be where he can keep control of the controlling force of his fleet. The other forces are important for subsidiary uses, but the battleships must be employed for the decisive work whether he aims to destroy the enemy or to save his own fleet. If he wishes merely to frighten the enemy, to baffle him, to evade him, or to cause him minor damage, the other forces may find larger active use than the battleships, but if he is seriously in earnest in his desire to do the enemy harm, the minor forces but prepare the way.

Since radio signals are used almost to the exclusion of visual methods, the argument set forth in (b) falls flat. Even with visual signals, it is entirely a matter of wind direction whether they can more easily be seen if the flagship is in the line or out of it. This reason, advanced some years ago when the special flagship idea first appeared, has no longer its former potency.

As to (c), it is, of course, impossible to watch the enemy better behind the line than in the line, and it would seem a matter of considerable importance to see exactly what the enemy is about at all stages of the battle. It is certainly of more importance to see the enemy, and to see our own ships that lie between or flanking the two lines than to view the unengaged side of our line and our other vessels that are altogether out of the action. If the wind is blowing from the enemy toward ourselves, the smoke will shut off the view from a flagship behind the line not only of the enemy, but also of all our own forces. Ideas as to the progress of an engagement gained from such a position would probably be erroneous.



The statement in (d) is, however, one that cannot easily be passed by. It is quite true that the ship's complement and the flag complement are both crowded and hampered by each other, but these unfortunate conditions have been accepted in the past without any great effort having been made to overcome them. The question of quarters is important, but since, in the opinion of many, the present officers' staterooms on board can be reduced in size without any great sacrifice of comfort, and additional rooms more habitable than those on many smaller ships can be built, this crowding can, with some care, be partly reduced and partly accepted with small loss in efficiency. As the number of enlisted men required for the flagship is only slightly greater than for a battleship, the question of their billeting is easily settled. As to the staff functions now performed on other ships these are, in fact, minor, and it is difficult to see why in any case there need be a fleet marine officer, a fleet supply officer, and a fleet chaplain attached to the staff of the commander-in-chief. There are few marines afloat except on the battleships, and the battleship force marine officer could, it is thought, combine his duties with those of the fleet marine officer. The fleet supply officer now seems out of place and should be on the staff of the commander of the train, while the fleet chaplain could perform his duties as well on any other ship. It is possible that a scrutiny of the existing staffs would disclose that other positions might be abolished and so allow room for the desired increase in staff officers of the line whose duties would be wholly military. In the past, in the navy, staff officers have been regarded as luxuries, and adequate quarters, offices, and battle stations have not been included in the designs of flagships. Suitable facilities of this nature should be provided, however, even if at the expense of reducing the actual fighting efficiency of the ship.

So far as (e) is concerned, it is probable that all of the duties required of the admiral's staff can be performed as well at sea as in port. Urgent communications with other stations are sent by radio, while others can wait for the mail tug which visits the flagship daily unless the latter is well out to sea. It assuredly isn't desirable, as one officer expressed it, to "set up a little Navy Department at anchor in Hampton Roads," and sea cruising is

equally good, as a matter of battle training, for staff as well as for all other naval officers.

The reason set forth in (f) appears as important as (d). It is undoubtedly a fact that if a battleship is the only ship an admiral has at his disposal he will largely be prevented from paying those personal visits to the various forces that add so much to military efficiency. This is particularly true at present, when the fleet is scattered to the winds, with detachments all the way from Hawaii to Boston. But are we not attempting to correct the faults inherent in such lack of concentration by an equally faulty device? By all means let the admiral have a suitable tender for his own use—even the *Columbia*—but his actual flagship, the ship in which he cruises and where his staff functions should be the battleship in which he will some day fight. What is to prevent the real flagship from cruising this year in the Atlantic and next in the Pacific, and why can't the very small number of inspection trips by the admiral (once a year to Newport and Charleston, or Panama and Hawaii) be made in his tender? In any important war involving the United States it is not probable that the commander-in-chief will make extended trips away from the battle forces in such a vessel as the *Columbia*, while he will doubtless make short trips in a destroyer. Therefore this reason is not so important after all, particularly if the policy of yearly fleet concentration and maneuvers is carried out.

The errors that have arisen in considering this question are doubtless due to a misconception as to what really constitutes the fleet. We look upon the fleet as made up of a collection of forces composed of vessels such as battleships, cruisers, destroyers, submarines, and aircraft. In this we are wrong. In any war in which the United States will seriously rely for success upon its fleet that fleet will consist of the battleships—with numerous other craft *to assist* the battleships in carrying out their mission. The battleship force *is* the fleet; it is the force with which victory will be won, *and all the other forces will be used merely for the preliminary work and to make ready for the effective use of the battleships.*

Any device that takes from the commander-in-chief his power of using the battleship force with instant facility for gaining

his ends is fundamentally wrong. He should, indeed, be its immediate commander, and whatever organization is necessary to relieve the admiral of administrative details should never be allowed to separate him so far that he will cease to be the actual tactical commander of that force. The battleships will decide the day in our future naval actions, and since no argument will ever displace that fact, then we should at once admit that the place of the admiral, the responsible leader, is with those vessels *at all times*. It must be in his power to employ them as he sees fit, and this he cannot do if he is in a special flagship miles away at the decisive tactical moment.

It may seem at first sight that the present "Two Flagship" system will meet these requirements, but further consideration will show that many of the disadvantages of the "Special Flagship" system have been accepted, while most of the advantages of the normal system have been discarded. This apparently is the proposal of those who, being unwilling to go the whole way, would stop in the middle; unable to cross the river at one jump we would make it in two, which will be fatal if the flood of war catches us in mid-stream. The whole movement stops but one step short of the old British system that allowed the commander-in-chief of the battle fleet to hoist his flag on his house in the dockyard.

Let us suppose that two years hence we engage in a war in which the employment of our battle fleet is required a short time after the declaration. Also let us picture what will happen if the "Two Flagship" plan persists until that time.

This year, because of lack of funds, there will be no joint maneuvers and the *Columbia* may be expected to remain in the Atlantic. The admiral and his staff will therefore be unable to direct the tactical handling of a battle line of our most important vessels, which are in the Pacific, at least until next year. After these maneuvers the admiral will then return to the *Columbia* for another year, at the expiration of which we assume that war breaks out. If the fleet has already been concentrated, we may then expect the admiral to take up quarters on the *Maryland*, in view of the imminence of a capital action. However, he may elect to remain with his entire staff on the *Columbia* while in port.

going aboard the *Maryland*, with a few assistants, only when the fleet puts to sea.

When he goes to the *Maryland*, which meanwhile has been exercised as one of the units of a division, whom will he take along? Will the entire administrative staff go, or just those officers concerned with the tactical handling of the fleet? The former plan can not well be followed if, as has been stated, the staff is too large to add to the personnel already on a battleship. Then who will remain on the *Columbia* to direct the reduced "administrative" staff, and what will be the result, at the outbreak of war, of such a division of this staff?

The duties required of the signal and radio forces, the yeomen and the internal communication force are very onerous on board the "Big Flag," whether at sea during maneuvers or in port. These officers and men require careful training; the work performed by the similar personnel of an ordinary ship, such as the *Maryland* would be under usual conditions, is by no means so heavy or important as in the case of a flagship. When the admiral goes on board the *Maryland* at the outbreak of war will he take his own communication forces with him, or will he depend upon such a hastily organized staff as that vessel will be able to improvise? Will the routine communication work still be handled by the *Columbia* with a reduced force, or will it be taken care of on the tactical flagship no matter what distance separates it from the administrative flagship?

How many of the administrative files, reports, war plans, and other papers will the admiral take with him? Certainly some must go, because the *Columbia* can hardly be expected to go to sea with the battle fleet when an action is impending. Can all of the files go, in view of the fact that certain staff work is still to be performed on the *Columbia*?

When several officers from the Planning Division of the Office of Naval Operations join the admiral, will they go to the *Maryland* or the *Columbia*?

Some of these are knotty questions requiring careful consideration to answer, since upon the correct answer depends a great part of the efficiency of the staff and fleet. They are not, however, the really important questions.

Everyone knows the extraordinary amount of detailed drill required of both officers and men to keep a ship efficient in matters of fire control. Drills are held daily for the purpose of testing communications and training men to speak and hear over the telephone standardized words that have been reduced to a minimum by careful elimination. Fire control duties are all simple, and yet they require constant and unremitting practice in order that efficient co-operation may be attained. Simple duties in various parts of a single ship are co-ordinated by simple words—and yet what long hours of training this takes and how hard it is to keep the system efficient! Merely for the sake of keeping these simple affairs in order we require all hands to drill daily at their battle stations so that familiarity may bring perfection.

Such work is indeed simple compared to the work of maneuvering a fleet of varied forces. How then more necessary it is for the admiral's staff, and the admiral himself, to exercise at their vastly more important, intricate, and difficult battle duties with sufficient frequency to eliminate error! It is no more possible daily to maneuver a fleet than it is daily to fire a target practice, but it is of the utmost importance that each detailed duty performed by the staff in action be performed very frequently, *even daily*, so that the mechanism of command may run smoothly. The staff personnel should be as familiar with their battle stations and their battle duties as are the ship's personnel—their telephones, and signal flags, and code messages, and plotting, and casualty drill are the most important in the fleet.

It was but a few years ago that the fire control personnel of a ship were few in number and exercised but seldom at their stations; the growth of our knowledge of what is necessary in the way of controlling a ship's fire has made us increase the number of men performing such functions until the complexity of the machine requires frequent operation of all its parts. Perhaps even yet we haven't realized that we need an even more intricate machine for the control of a fleet in battle, a machine that can be made efficient by one means only—hard work and frequent drill. These cannot be directed from the administrative flagship, but only in the exact surroundings, with the same facilities, and on the same ship where the admiral fights the action, so

that on the day of battle his staff may know the use of their weapons.

Furthermore, it is important that the battleships continue to look to the commander-in-chief for direction and for personal leadership. The habit of mind produced by frequent contact between the division, squadron, and supreme commanders will be a very important factor in an action. Indoctrination of this force with the ideas of its commander and the resulting unity of action cannot be attained except through the personal relation that has invariably had so great a part in the maintenance of the fighting spirit in successful fleets. The subsidiary forces, who do not fight under the detailed direction of the commander-in-chief, require this personal contact to a less extent; this can be supplied at times of combined maneuvers or by special visits undertaken during periods of overhaul or primary drill of the battleships.

The battleship force should be handled as frequently as possible—every time it gets under way as a force—by the man who is to handle it in action. The Germans were long known to be very expert in fleet maneuvers, having attained their proficiency by constant drill. Is it to be supposed, with the present system of employing two flagships, or with our present tactical organization, that the United States Fleet will ever be able to perform so superb a maneuver as that of Von Sheer's in the battle of Jutland when, after two complete reversals of fleet course, he hurled himself, in emulation of Trafalgar, at the British center? Can we execute such precise drill unless we return to a system of active personal command that will allow such performance?

The British failure at Jutland cannot be laid to lack of administrative facility, for, as has been shown, their preliminary staff work up to the moment of battle was well-nigh perfect. The information sections, the planning units, the communication service, the guard and sweeping divisions, and the control of forces scattered over a wide area all functioned so marvellously that the Grand Fleet was brought to the correct meeting point with a smooth perfection that is admirable. Every precaution was taken, every contingency provided for; but the British failed to gain the decisive victory they so confidently expected. Success eluded them not because of defective ships, faulty organization, poor

gunnery, or lack of information, but because of ineffective tactical handling of the battleships.

It may seem necessary to distribute the detailed administrative duties connected with control of the battleship force, but these can well be taken care of in the squadron system of organization, which yet leaves the commander-in-chief as the actual commander of that force. In war it is extremely doubtful if the admiral will leave his battleships if their use is at all likely, and we should simulate in peace conditions that will obtain in war.

The logic of circumstances is against the older movement to put the admiral, during action, any place but in the heavy battle line and in the best position therein to control his most important fighting ships. It is unthinkable that he will remain in the line in any ship incapable of giving blows as hard as it receives, of taking but not inflicting punishment. Therefore the special tactical flagship idea will not persist. But the newer movement for the "Administrative Flagship" should not be accepted without very searching consideration. The subject has as yet received but little thought by the service at large, doubtless because it appears at first as not of major importance. Unless, however, we are willing for the lethargy of peace to allow this new plan to become a fixed institution that may plague us in war we should view the experiment with a critical suspicion that will be satisfied only in case of its unqualified success. The navy must have proper facilities for the conduct of its affairs both in peace and war, but, though the former is the normal state, the latter is the fleet's sole reason for existence; steps taken to increase our ease in peace must not compromise our effectiveness in war. The fleet must, in peace as in war, be directed by a fighting leader in a fighting ship.





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## NAVAL REGULATIONS<sup>1</sup>

BY CAPTAIN H. E. YARNELL, U. S. N.

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In blocking out the course of instruction at this school it was decided to have a few lectures on subjects which concern us all intimately as destroyer officers before beginning tactical work on the game board and the instruction in scouting and screening which will come later.

After the lectures which you have already heard on "Handling of Men" and "Destroyer Seamanship," the present subject is in the nature of an anti-climax as far as our interest and liking are concerned.

However, in any organization, rules and regulations are necessary, and it was considered that an hour or so spent on those governing the navy might serve to call attention to their importance and lead the officers of this school to refresh their memories, and perhaps to a more careful observance, the necessity of which is obvious to all.

The present volume of *Navy Regulations and Instructions* is the growth of over a hundred years and is perhaps as good a measure as can be found of the great changes that have taken place in naval personnel and material in that time. Human nature is not subject to such great changes as is the machinery created by human ingenuity, and in the regulations relating to morals and conduct you will find fewer changes than in those relating to material.

The Articles of War for the government of the navy have changed but little in a hundred years. In fact they were originally

<sup>1</sup> A lecture delivered at the Destroyer Staff College, Charleston, S. C., October 21, 1920.

taken from the British Articles of War which dated back to Cromwell's time. I think you will agree with me that it would be difficult to improve the phraseology of the first eight articles. Yes, they contain in the brief space of three pages a complete code of all that goes to make the highest type of an "officer and a gentleman."

The first paragraphs contain the specifications of an officer. He must be "a good example of virtue, honor, patriotism and subordination." The writer of the Articles of War was evidently a profound student of human nature and consequently described at the outset what the qualifications of a leader should be. The mass of men look to their leaders for example. They expect their leaders to show themselves bigger, stronger, and better than they are. Leadership implies superiority, and being better than other people carries penalties as well as rewards. A man must be eternally making good at it, or be stripped of his lace and reduced to the ranks in the minds of his followers, even if for the moment they are powerless to demote him physically. So, unless you set a high standard for the officers and men under your command you cannot expect to be a true leader.

The second Article recommends the attendance at divine services. While freedom of religious belief is part of the foundation of our government, it is not to be interpreted as encouraging atheism; and a naval service whose officers are Christian gentlemen will win in the rude shock of war over a service composed of atheists. Cromwell's praying Roundheads were unbeatable in battle.

The fourth Article enters into more detail regarding the standard of conduct expected in time of war or battle. I defy any master of the English language to improve upon the clearness, conciseness, and directness of expression employed in these phrases. Even when long words are used, they seem to be the only ones that express the meaning.

One of the phrases in this paragraph was responsible one hundred and sixty years ago for the tragic death of a British admiral who was shot to death by musketry on the quarter deck of one of his ships in accordance with the sentence of a court martial which found him guilty of not doing his utmost to capture and destroy an enemy fleet. I refer to the case of Admiral Byng

and his engagement with the French fleet off Port Mahon, May 20, 1756. In those days, the Articles of War did not contain the phrase "or such other punishment as a court martial may adjudge," but prescribed the punishment of death. Byng was found guilty, and as there was no alternative punishment, the court felt compelled to sentence him to death. The King refused to pardon, and the unfortunate admiral was accordingly shot.

This case of Byng deserves rather close study since the cause of his failure was not cowardice, but a too literal adherence to "Fighting Instructions" which combined with an ignorance of principles, kept him from engaging the enemy with his full force when once joined in battle. War and battle cannot be carried on by rules and regulations, but they can and must be carried on in accordance with principles which it is our task here to attempt to deduce for destroyer forces.

In paragraph seven we have more detailed specifications of the code which apply to both officers and men in both war and peace. I particularly invite your attention to paragraph two of this article:

Such punishment as a court martial may adjudge may be inflicted on any person in the navy who is guilty of cruelty toward, or oppression or maltreatment of, any person subject to his orders.

If you look back over the court martial records of fifty or sixty years ago you will find a number of cases of officers in command tried for actual physical cruelty and maltreatment of persons under their command. Happily such cases do not exist today, but the implied obligation in this paragraph to see that every person under one's command receives justice is just as necessary today as it was a hundred years ago, in the great art of handling men.

Other paragraphs to which your attention is invited are paragraphs five and six of Article 20. Here is an Act of Congress which specifically provides that a commanding officer shall always supply a transferred man with his pay accounts and shall refuse to receive on board any man from another ship who is not supplied with the same. I dare say that this Article has been recognized

more in the breach than in the observance, especially during the late war.

Many of the regulations have a history behind them—sometimes tragic, and sometimes otherwise. If we had a record of what was the actual cause of their being written it would furnish material for a most interesting book.

Article 53 of the Articles of War prescribes that no sentence of a court-martial involving a death sentence can be carried into execution until confirmed by the President.

While not certain, I have the impression that this Article was the result of the mutiny on the brig *Somers* in the early part of the nineteenth century. In this case a midshipman named Spencer and two seamen were found guilty of a plot to seize the ship, murder the officers, and such of the crew as would not join them and turn pirate. They were sentenced to death, and the captain of the *Somers* immediately carried the sentence into effect. Spencer was a nephew of the Secretary of War and the case caused widespread comment at the time.

Article 845 of the Regulation which provides that force shall be employed to prevent search of a naval vessel or removal of any of her officers or crew by any person representing a foreign state is what we were fighting for during the war of 1812.

All of you can perhaps recall the circumstances that led to the insertion of Article 724, paragraph 2 in the Regulations. That was the demand for a salute at Tampico in 1914 by the senior officer present.

Articles 721—725 inclusive which prescribe the duties of a commander-in-chief or senior officer with regard to Intercourse with Foreigners are the result of years of experience and to all officers they are especially important. A recent letter from the commander-in-chief which quoted correspondence between the War and Navy Departments regarding the assumption of authority by a military attaché over naval forces in a foreign country is of interest in connection with the above regulations.

It must be admitted however, that to an officer in his first experience of protecting American lives and property in Latin-American revolutions, the above mentioned regulations will give little but negative assistance. First, he is enjoined to consult our diplomatic and consular representatives and “carefully and

duly consider any request for service from any such representatives." Usually in times of stress these representatives are more or less panic stricken, and are insistent that landing parties should be sent ashore at once.

Also the regulations are specific in stating that "the responsibility for any action taken by naval force rests wholly on the commanding officer thereof." This exclusion of responsibility applies to the Navy Department as well which must disavow the act of the commanding officer if such does not meet with the approval of the State Department or the President.

So it would appear at first glance that the naval commander in such circumstances is damned if he does, and damned if he doesn't and such may be the case.

The answer is contained in Article 723. When after a cool and careful survey of the situation, a commanding officer believes that lives and property of our citizens are in danger, he should take steps to protect them. Never err on the side of inaction.

It is not necessary to quote further examples of the historical phase of Regulations, but enough has been given to show that back of many of the Articles and paragraphs have been circumstances that required them to be included.

In *Naval Courts and Boards*, 1917, P. 7, we find the following:

The Navy Regulations are next in point of authority to the formal enactments of Congress as expressed in the Articles of War and other laws found in the Revised Statutes, and the Statutes at Large.

They comprise the administrative rules relating to the Navy and are authorized by section 1547 of the Revised Statutes, which provides that "the orders, regulations, and instructions issued by the Secretary of the Navy prior to July 14, 1862, with such alterations as he may have since adopted, with the approval of the President, shall be recognized as the regulations of the navy, subject to alterations adopted in the same manner."

In naval matters the President speaks and acts through the Secretary of the Navy, and regulations issued by the latter are in legal contemplation of the regulations of the President. In some instances, the President expressly approves; in other his approval is implied; but the legal effect is the same, all regulations promulgated by the Secretary of the Navy being equally binding and having the full force and effect of law whether or not expressly approved by the President.

So our Naval Regulations are law for us, and as ignorance of the law excuses no one before the bar, it is up to us to know

the Regulations if we want to become good naval officers, or if we want to keep out of trouble.

Now for a few remarks on the subject of Rules and Regulations in general, and I am done.

In an ideal community no laws or regulations would be necessary as everyone would know what to do and would do it.

Ideal communities do not exist on this earth, however, and a certain number of rules and regulations is necessary. The number of regulations that must be drafted is, however, a close gauge of the efficiency or law abiding proclivities of any organized military or social body.

If we see a ship or a squadron whose commander is constantly issuing numerous orders and regulations, the ship, or the squadron, or the commander must be inefficient. They may be required for a short time when breaking in a new organization but no permanent flow of new regulations is necessary or desirable.

The tendency to draft regulations to cover all conceivable cases is illustrated in the old story of an executive officer who was thus afflicted. One day a sailor man used the tray latch catch of No. 1-6 gun as a sinker for his fishing line. Promptly there appeared in the officer-of-the-deck's order book an order announcing that—"hereafter, the tray latch catch of No. 1-6 gun should never be used as a sinker for a fishing line." When you multiply the number of objects on board a ship by the number of illegitimate uses to which they can be placed, you can imagine the field that was open to this executive officer.

The great danger of a mass of regulations is that owing to our limited mental capacities, a certain number of such regulations are bound to be overlooked or forgotten. The average intellect will argue that if one regulation can be broken without punishment, why not all. In other words, obsolete or unnecessary regulations greatly weaken the standing and authority of the necessary ones. So to be effective, regulations should be concise, should not attempt to cover every detail, and should not be changed except for very adequate reasons. Permanency is a valuable asset to us in many respects, provided it does not degenerate into a stagnating conservatism.

If we had in the navy a volume on "Customs of the Naval Service" similar to the one for the Army, which could be taught

to midshipmen and recruits, it would do much to assist in indoctrinating officers with the unwritten and written laws of the service.

When rules and regulations become a part of our mental atmosphere so that they are followed automatically or subconsciously, then much of the friction of administration disappears. Many of the signals and letters that now fill the yard arms and typewriters become unnecessary, and there is more time, mental and physical, for the larger problems that confront us. This requires constant study. Let us make it a practice to read over the Regulations every so often. Not all of the book of course, but those chapters that especially concern us. It will make our task easier and also that of our superior officers.

What has been said applies also to the fleet and the destroyer regulations. They were written for a purpose, and some good reason lies behind the existence of every article.

A good way to read them is to assume that you have been detailed to revise them and debate in your mind whether each paragraph can be improved, whether it is obsolete, or whether it is a repetition of a regulation contained in another publication. Can you improve the wording to make it clearer or less verbose? Suggestions for improvement will thus arise which should be sent to the flagship for consideration when the force regulations are revised. Never hesitate to criticise when such criticism is constructive. Through the combined brain work of the youth and energy of the navy as represented by the officers in our destroyer force we can achieve great and lasting results.





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## AMERICAN AND BRITISH DESTROYERS

BY LIEUT. T. E. CHANDLER, U. S. NAVY

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Since such a wide variety of types of light craft were used so extensively during the World War, it will be well for us, in preparing for the future, to give very careful attention to the design of our smaller vessels, particularly destroyers. Torpedo boats, destroyers, and flotilla leaders were employed by the British in many varied activities; against capital ships in both day and night attacks, as scouts and patrols, as fast mine-layers, for convoying, and for all forms of anti-submarine work. In the case of our destroyers, however, no such wide application was found, for they were employed exclusively in anti-submarine work either as patrols or escort vessels. No American destroyer had an opportunity to fire either guns or torpedoes at any other target than a rapidly disappearing submarine and even these opportunities were most infrequent. The highly specialized service rendered by our destroyers must not be allowed to blind us to the true function of the type in a more general naval campaign. It is accordingly advisable for us to observe what types of destroyers are being built by other navies. We should be especially interested in the types developed by the British as they had the greatest experience in the use of destroyers and are the originators of the flotilla leader. A comparison of the newest British destroyers with our own discloses some very interesting points of difference and shows certain features that we may do well to imitate.

The first feature to consider in any vessel is her seaworthiness. In this respect it may be said of all our newest destroyers, for their hull design is identical, that their seagoing qualities are, under most conditions, quite good. The roll, though deep, is

slow, which is beneficial for gunnery. However, for bucking even a moderate head sea at speeds of twenty knots or above, they cannot be said to be very satisfactory.

British destroyers of all sizes are also practically of one type as regards hull form but this form is radically different from that of our boats. The outstanding feature is the wide flaring bow, called a "Trawler Bow" by Jane. They also have rounded sterns and are more heavily built throughout than our boats. The design is said to have been adopted at the insistence of the commander-in-chief of the grand fleet for a destroyer that could make twenty-five knots in any weather in which a battleship could steam full power and still use her guns. The type was standardized only after considerable experiment and after several unsatisfactory types had been tried and rejected. Under these circumstances there seems every reason to believe that all British destroyers are highly satisfactory as regards their seagoing qualities.

Seaworthiness is a quality in which it is difficult to make a definite comparison. Furthermore, the writer knows of no one having seagoing experience in both types who could be considered an authority as to their relative merits. Although one can judge only by appearances, the British boats undoubtedly appear to be much the more seaworthy. Certainly in a head sea, at least, they would fare far better than our own.

The next feature to be considered is speed. Our destroyers all have a contract speed of thirty-five knots. Some of the earlier boats cannot make their contract speed but most of the new ones make it with ease and some boats have even made runs as high as thirty-eight knots for short periods. The latest British flotilla leaders, a type not possessed by the United States, but one which merits our careful consideration, have a speed of thirty-six and a half knots, while the destroyers have speeds ranging from thirty-two to thirty-four knots. From Jane we may draw the general conclusion that on the whole the speed of our destroyers is superior to that of the British, but by only a small margin.

It is in the question of the armament that the most radical differences may be found. All American destroyers are practically of one type as regards armament, there being a few minor differences in arrangement but nothing really vital. There are

four 4" guns located as follows: one on the forecastle, well forward of the bridge; one on each side of the galley deck house, located near the deck edge; and one aft, either on top of the after deck house or on the fan tail. The guns forward and aft are on the centerline but those on the galley deck house are only available on one broadside. The galley guns possess three advantages, namely: they have a good platform for the loading crew on most bearings, they are dry for use in nearly all weather, and they have the questionable advantage of extreme depression which might be of use in firing at a submarine close aboard. The disadvantages of this arrangement are that they cannot be fired forward of ten degrees on the bow because of the proximity of the bridge and that at least one gun is restricted in its fire aft by a nearby boat. Also the guns in the extreme forward and aft positions would be very difficult to serve. We see then that this arrangement gives no bow and stern fire and that a single gun mounted on the centerline at this point would possess almost as great an arc of train as the two at present installed. A few of our latest boats have 5" guns in place of the 4" but the arrangement is the same.

Anti-aircraft guns in the past have been of two different types and have been located in various places. It is understood, however, that it is intended that all boats will ultimately have one 3" twenty-three caliber gun located on the fan tail.

All our destroyers carry twelve torpedoes which are mounted in four triple tubes, two on each side.

The British have twenty-two flotilla leaders of slightly varying types, of which the Douglas class represent the very acme of superdestroyer construction, with five 4.7" guns, one 3" long caliber sky gun, and six torpedoes in two triple tubes, all on the centerline. The first class of destroyers consists of two "Thornycroft Improved W" and fourteen "Admiralty Modified W" classes. These ships have four 4.7" guns on the centerline, two anti-aircraft one-pounders, called pom-poms, and six torpedoes in two centerline triple tubes. The next is the "S" class of sixty-one boats, five "Thornycroft," six "Yarrow," and fifty "Admiralty." These boats all have three 4" high angle (30° elevation) guns on the centerline and four torpedoes in double centerline tubes. The last considered in this article consists

of nineteen "Admiralty W," two "Thornycroft W," and twenty "Admiralty V" boats. These have four 4" guns and a long caliber 3" sky gun on the centerline and six torpedoes in two triple centerline tubes.

The characteristics of the different types considered indicate plainly that in torpedo power our ships are unquestionably superior and it is believed that our doubling the number of tubes instead of having half as many on the centerline is correct. Tubes mounted outboard have a greater arc of train than centerline tubes due to the fact that the falling torpedo must clear the deck edge on leaving the tube and that the impulse charge does not carry it far. This practically restricts the fire of centerline tubes to beam shots. One British officer admitted that their centerline triple tubes could not be fired more than ten degrees forward or abaft the beam. Moreover, should it be desired to fire all twelve torpedoes in one attack it is believed that in most cases there would be an opportunity to turn and deliver the other broadside. Thus our non-centerline arrangement of tubes is considered to be fully justified.

It is equally plain that the British destroyers have a very material superiority in gun power and that our deficiency in this respect is not due to the fewer guns carried but the failure to adopt a centerline arrangement. Only one class of British boats, the "S" type, of which no more are being built, have only three 4" guns on a broadside as is the case in our boats. The next class have four 4" on a broadside and that gives a 4 to 3 superiority over our boats. The newest class have four 4.7" guns on the centerline, and thus the 4 to 3 superiority ratio is obviously much increased. When we come to the flotilla leaders with five 4.7" guns on the centerline as opposed to three 4" on a broadside any comparison is futile. The fact that two of our boats, the *Hovey* and the *Long*, have 4" double guns and that a few of the newest boats have 5" fifty-one caliber guns in place of 4" does not controvert the general statement of British superiority. Even with 5" guns a broadside of three 5" guns is inferior to four 4.7" and certainly much inferior to the flotilla leaders with five 4.7" guns. Also the installation of the heavier guns does not correct the error in principle caused by the failure to mount all guns on the centerline; the boats remain correspond-

ingly weak in gun power relative to what they could have been with the guns properly located. Another factor which increases the British preponderance of gun power is the fact that their 3" anti-aircraft gun is mounted on the centerline, is at least a forty caliber, and could be used as a very effective part of the main battery. Our 3" anti-aircraft gun is but twenty-three caliber and would be of little use except at very short ranges, though it is no doubt excellent in other respects.

A summation of the above material shows that the British destroyers are probably more seaworthy. Our boats should be more heavily built forward, especially at the bridge and chart house, and the "Trawler Bow" should be adopted.

In speed the American destroyers are superior and no changes in engineering installations seem appropriate.

Likewise our boats greatly excel in torpedo power and the present arrangement of tubes is satisfactory and should be retained. The question of obtaining the greatest gun power for a given weight of battery, however, merits careful consideration. The British destroyers can deliver a far heavier broadside than ours due solely to the centerline arrangement. The lessons of the war have brought out even more strongly the already well-known fact that gun power is a vital factor in destroyer design. There were many more gun engagements between destroyers and various other light craft than there were opportunities for firing torpedoes. In the day attacks at Jutland it was shown that destroyers have little hope of reaching a position where a successful torpedo attack can be launched against capital ships, unless the destroyers have sufficient gun power to beat off the enemy boats that are sure to be sent out as a counter measure. The British destroyers' preponderance in gun power was an important factor in the many engagements between scout forces and always gave them a great advantage.

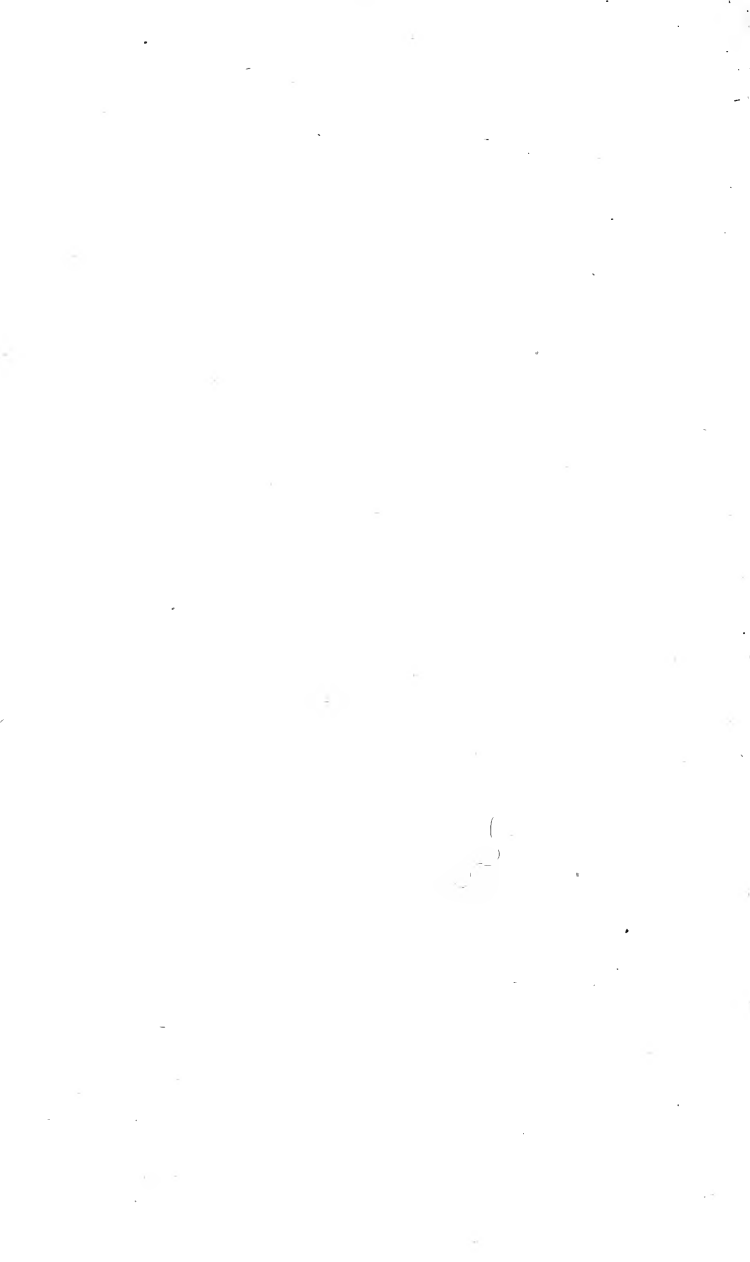
The object of this article is not to show that the British destroyers as a whole are superior to ours but to call attention to certain features in design. The fact that our destroyers are inferior in gun power to the British is not so serious as our persistence in adhering to an incorrect type. The unfortunate part of the whole question is that, whereas the British have adopted an excellent arrangement for their battery and are

building boats of that type only we have chosen a less efficient arrangement, have standardized it, and seem inclined to continue to build boats of that kind indefinitely. The location of the waist guns off the centerline, and the standardizing of that type of destroyer so that approximately 300 have been built seems to have been a serious error. Why this occasion was taken to depart from the centerline arrangement of guns, one that was at last arrived at after all navies had spent millions in the construction of relatively inferior ships, is hard to understand.

The proper measures to be taken in the attempt to redeem this error in the location of the battery are briefly as follows: first, the present design should be abandoned at once and any ship not already completed should have her battery relocated. Secondly, a rational centerline arrangement of guns should be adopted for all new construction and unless something better is devised, the British design should be copied. Thirdly, if practicable we should combine our stacks as the British do and have only two instead of four. If this is not desirable we should at least combine them to have only three as in the "Conner-Stockton" type. We could readily build destroyers with two guns forward of the bridge, by using the British super-posed arrangement, one on the galley deck house, a 3" long caliber sky gun on a platform abaft the after stack (artificial ventilation being installed for the engine rooms if necessary), one on the after deck house, and one on the fan tail. This would give us five guns on a broadside, all 5" if practicable. The best of the boats already built should be altered as opportunity offered and funds became available. These ships could readily be redesigned to have a broadside of four guns by removing the galley deck house guns and mounting one gun amidships at that point, putting the sky gun on a platform just abaft the galley, and locating an extra gun, on the fan tail or the after deck house. Although it is noted it may be difficult to design the sky gun platform so that the supports will not interfere with torpedo tubes, by careful spacing, and, if necessary, by the use of forced ventilation in the engine rooms, it will be possible to install it.

Emphatically we should not build any more destroyers of the present type. Homogeneity is a valuable quality for the units of a force, but we must not sacrifice all progressive ideas to attain

this end. With the modifications suggested in the hull and gun arrangement, our future destroyers can be placed in the same class with our other new construction in being the best and most advanced in the world.





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## CO-ORDINATION IN ARMY AND NAVY TRAINING

BY COLONEL DION WILLIAMS, U. S. M. C.

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“United we stand; divided we fall.”

In the writings of every authority upon military and naval campaigns and operations, past, present, and prospective, there will be found mention of the importance of intelligent co-operation between the Army and the Navy of any nation at war if the best and quickest results are to be obtained.

If Napoleon at the height of his power could have succeeded in his attempts to build and equip a navy even approaching in efficiency his land forces he would have conquered England, the power that was his ultimate undoing; but the lack of proper training for the French Navy of that period and the utter lack of co-operation between the land and sea forces enabled England to retain control of the sea and prevented Napoleon from invading England, although he got the “three days’ east wind” that he longed for when his great army was concentrated at Boulogne for the invasion of the one nation he had failed to subdue.

For many years there was a prevalent idea that the functions of armies and navies were so different and their training so divergent as to preclude their combined operation as one force. A lack of mutual understanding of the functions, powers, and limitations of the two services and a lack of acquaintance one with the other had much to do with this. The services were not trained in peace to co-operate in war, and when the need for such co-operation came, failure too often resulted.

To come to a proper basis for combined training of the Army and the Navy which would go far toward preventing a repetition of the mistakes of the past it is necessary to acquire an under-

standing of the necessity for and value of co-operation between every portion of the nation's military resources. As Rear Admiral H. S. Knapp so aptly states the case in his lecture on "The Co-operation of the Army and the Navy":

The Army and the Navy have the same ultimate function—to serve as the offensive and defensive arms of the Government. In one sense they are separate and distinct, but in a broader and better sense they are parts of one whole just as the arms and legs are members of one body. It will be an ideal condition when the Army and Navy act instinctively together to accomplish the same purpose, as the legs and arms instinctively obey the will. The fact is that the Army and Navy are largely interdependent and both are necessary to the government of a maritime power, each in its own sphere. When working separately that sphere is outlined with such definiteness that neither need concern itself in the doings of the other with any feelings of responsibility; but when they are co-operating neither can escape the responsibility for its own share toward the result.

Lieutenant General Von Janson, in his *Strategical and Tactical Co-operation of the Army and Navy*, says:

It is certainly desirable that the organs of the Army and Navy called upon to confer with each other should from the outset stand on the same ground and that they should be able to understand each other in general matters without special tactical explanation, so that it may not be necessary to define the meaning of the most common ideas and terms; that is to say, the two branches should not confront one another as though coming from different worlds, each having views and a language unintelligible to the other. . . . The assignment of some army officers to the navy, and vice versa, is a means of fitting them for joint preparation for war and in war for joint command.

In all wars requiring operations overseas both the Army and the Navy will be called upon to do their share. As stated by Sir Cyprian Bridge in his *Art of Naval Warfare*:

Unless one of the two antagonists is specially circumstanced, or both are, naval campaigns by themselves are not likely to end a war or cause the complete surrender of one side. A purely naval contest may wear out one belligerent; but the process will be long, and if one side is quite worn out, the other will almost certainly have begun to feel the effects of fatigue. Consequently, as a rule naval strategy should aim at enabling a land army to give the finishing stroke.

As a basis for mutual understanding between the Army and the Navy in training for co-operation in war the statement of

the case by Colonel C. E. Callwell in his *Military Operations and Maritime Preponderance*, may be assumed:

War on land and war on the sea have this in common, while military tactics and naval tactics are constantly going through a process of evolution as the science of producing arms of destruction progresses, the broad principles of strategy ashore and afloat remain unchanged from century to century.

It remains, then, for the two services to so co-ordinate their training that the tactics of the two may be mutually so well understood as to give promise of smoothness and efficiency when the time for co-operation comes.

In his book, *The Crisis of the War*, Admiral Viscount Jellicoe says in support of joint training:

In the matter of organization we must be certain that adequate means are taken to insure that the different arms which may co-operate in war are trained together under peace conditions.

In the service publication, *Joint Army and Navy Action for Coast Defense*, it is laid down as a guiding principle for co-operation that if the main problem to be solved in any operation is an army problem the Navy must co-operate with the Army, whereas if the main problem is a naval one the Army must co-operate with the Navy; but this does not settle the important question of command.

On this subject Colonel Furse in that thorough treatise, *Military Expeditions Beyond Seas*, says:

In all cases of military expeditions beyond seas there are three distinct phases, viz: the voyage, the disembarkation, and the subsequent operations. The direction of the movements of a large number of ships and of the squadron detailed to convoy them, requires the technical knowledge and experience of the admiral commanding. The second phase is a combined effort of the army and the navy, in which the general and the admiral are equally concerned; and, though in the third the former acquires the supreme direction of the operations, still he is very often dependent on the co-operation and assistance of his naval comrade.

The above are a few brief extracts from the wealth of authoritative opinion as to the great necessity of effective co-operation in combined Army and Navy operations, but the historical examples of the co-ordination in training which would make such effective co-operation possible are more difficult to find.

In the *Influence of Seapower upon History* Admiral Mahan first brought to the attention of the public at large the necessity of adequate naval power for the defense of a nation so situated as the United States, but he also laid stress upon the fact that such naval supremacy is not all and that there must be military power available to back up the naval power and make it effective; in other words, co-operation of Army and Navy is vital to success in great contests at arms between nations.

After the appearance of Mahan's great book the term "command of the sea" came into popular usage, but we find it loosely applied to various conditions. On the one hand it is taken to mean absolute control of the sea, the enemy ships swept from the sea beyond hope of recovery, a condition which would make the transport of an army overseas an easy task. A more limited meaning has been applied to the term to cover a condition of temporary control of an ocean or a large portion thereof by reason of the absence of the enemy fleet in distant waters or his temporary withdrawal after partial defeat for needed refit and repair.

It is hardly reasonable in a war between two fairly evenly matched naval powers to hope for the first condition, and the second condition scarcely justifies the embarkation of a large army for a long overseas voyage. If, however, one power gains such mastery on the sea by the defeat or containing of the enemy sea forces as to make reasonably certain the safety of a large transport of land forces overseas, that power may be said to have command of the sea. The term and its proper usage has a direct bearing upon all combined operations overseas of land and sea forces.

A brief review of the more or less recent historical events in which joint army and navy operations have figured, and of our past efforts at joint maneuvers for training, may serve as a background upon which to lay a picture of future requirements in various theaters where the Army and the Navy may be called upon to engage in combined action. In the lines of such a picture we may be able to trace the solution of the problem as to what processes should be followed in co-operative training in order to secure the best results.

## THE PHILIPPINE ISLANDS

When the destruction of the U. S. S. *Maine* in the harbor of Havana early in 1898 made war with Spain inevitable, after the long series of provocative disorders in the nearby island of Cuba, a squadron of United States naval vessels was on duty in Asiatic waters, where Spain had the important possessions of the Philippine Islands and the Caroline Islands in the Western Pacific. The commander of that squadron, Commodore George Dewey, was a very efficient, active, and aggressive naval officer and when given orders to act against the Spanish naval forces in the nearby waters, he proceeded with no delay whatever.

On April 26, 1898, at Hongkong, Commodore Dewey received the cable announcing the declaration of war by the United States against Spain and the following day sailed with his squadron for Manila, where according to his latest information the Spanish squadron was stationed. Running past the fortifications at the entrance to Manila Bay during the night of April 30-May 1, dawn of May 1 showed the United States squadron off the city of Manila with the Spanish squadron in line off their naval arsenal at Cavite a few miles distant. Commodore Dewey at once steamed to the attack and a few hours later the Spanish squadron was destroyed or captured and Manila and the Spanish naval base at Cavite lay at the mercy of the guns of his ships.

The Spanish commander at Manila was ready to surrender on demand and if Admiral Dewey could have had operating with his squadron a force of land troops sufficient to occupy Manila, he would undoubtedly have demanded the surrender of Manila and occupied it at once. Foresight in planning for a contingency that should have been self-evident during the period of strained relations preceding the actual declaration of war would have made such a force available; but lacking such co-ordination in plans and training, there was no such supporting land force available to take advantage of the naval victory of Manila Bay, either already embarked in transports or mobilized on the west coast of the United States ready to embark.

This is a striking example of the lack of proper co-ordination in planning and training between the Army and the Navy, and as such is worthy of careful consideration. Admiral Dewey, in the presence of the writer some years later, said that had he had

under his command with the squadron a force of two thousand Marines he would have forced the surrender of the Spanish land forces and occupied the city of Manila, and that it was his opinion that such action, had circumstances made it possible, would have cleared the way for the subsequent occupation of the adjacent country and the whole Philippine archipelago by the army expeditionary force which came later, and would have probably prevented the native insurrection which later occurred and which cost the United States so much in lives and money and time.

But such a landing force was not available to Admiral Dewey and he had perforce to wait a considerable time until the Army could be mobilized on the Pacific Coast and transported across the Pacific to invest and capture Manila and proceed to the occupation of adjacent territory. In the meantime the native malcontents had been given time to organize their forces and scatter their propaganda of revolt throughout the islands unmolested by any land force of American troops. The hopes of these active insurrectionists for immediate control of Manila and the Philippines was allowed to mount high due to these conditions, and when the belated arrival of the Army of Occupation prevented the realization of their little dream of power it took three years of hard campaigning to convince them of their mistake. All of this could have been avoided by properly co-ordinated plans and training in the United States prior to the war, or at least when it became evident that war was imminent.

Even after the arrival of the army expeditionary forces there was no prearranged co-ordination of the plans of the two services for necessary co-operation in land and sea operations. This resulted in delaying action while such plans could be decided and in many needless misunderstandings between naval and military commanders, all of which could have been avoided by previous combined training which would have indoctrinated the officers of both services so as to give them an understanding of the powers and limitations of their own service and of the sister service as well.

Prior to the Spanish-American War neither the Army nor the Navy had an organized plan-making agency, and as a consequence both services went into the war without any plans of

action for their individual service and no idea of real co-operation between the two services. The Army had no General Staff and the Navy had nothing approaching such an organization. "Any plan is better than no plan," but at this time there was no plan.

In the Atlantic, nearer to the seat of the home government at Washington, it was no better. The hurriedly devised plans of the Army contemplated the investment and capture Havana, the most important city and port in Cuba and the seat of the Spanish government in the island, which was correct as a general decision, but however good the plans we may propose an unexpected move of the enemy may at any time dispose of our well-laid plans. In a vain effort to save Cuba until hoped for aid might come in the shape of a European ally, Spain sent Admiral Cervera with all available ships to the West Indies. After the long Atlantic voyage it was necessary for Admiral Cervera to make a friendly port to refuel his ships for further operations, and of the available ports in Porto Rico and Cuba he chose the one farthest removed from the American fleet base at Key West, the harbor of Santiago de Cuba with its narrow entrance and protecting hills. Admiral Sampson arrived just too late to intercept the Spanish fleet before it gained the protection of the port and at once established a close blockade.

The narrow entrance to Santiago de Cuba was mined and commanded by the guns of the Spanish ships anchored within the harbor and mounted in shore batteries. It was impracticable to attempt a forced entrance with the American ships and a land force was requested by Admiral Sampson to assist him in taking the entrance to the harbor. In the campaign that followed the arrival of this land force there was a notable lack of co-ordination of plans and co-operation in action which was measured in delays in time, unnecessary losses on the part of the shore forces, and an undue prolongation of the war. The Navy opinion appeared to be that the Army was slow in its advance on shore toward what they considered the proper objective, the heights that commanded the entrance to the harbor, and that in making the city of Santiago the objective of the campaign the Army was failing to serve the Navy's urgent needs; the Army apparently took the view that the Navy should force the harbor entrance and destroy the Spanish fleet regardless of mines and an enforced

presentation end-on of the ships one by one to the concentrated fire of the Spanish ships and shore batteries; and both of these opinions are traceable to the lack of that indoctrination which would have given each service the proper knowledge of the powers and limitations of the other service and have furnished a correct basis for efficient co-operation to the attainment of a common goal.

The centralization of power and control at Washington was another direct result of the lack of predetermined plans for the co-ordination of efforts in the field; strategy boards and war councils sitting in Washington attempted to control the movements of the ships of the Navy and the tactical dispositions of the shore forces landed in Cuba, and such long-range control of movements in the theater of operations was productive of misunderstandings and delays that would have been avoided by a comprehensive, predetermined plan based upon a careful estimate of the situation to be met. Such a plan would have pointed the way clearly to decentralization of control to the extent of giving the naval and military commanders in the zone of operations full control of their forces to carry out the plan.

A study of the errors of the Spanish-American War in both the Pacific and the Atlantic led to a demand in both services for the formation of a General Staff. In the Army the result was the establishment of a Provisional General Staff to be followed later by Congressional enactments providing for the present Army General Staff, and in the Navy the immediate result was the organization of the General Board of the Navy under the able leadership of Admiral Dewey, to be followed a number of years later by the Congressional authority for the establishment of the Office of Naval Operations, charged with many of the duties of an Admiral Staff, or General Staff for the Navy.

The co-operation of the Army General Staff and the Office of Naval Operations through the medium of the Joint Army and Navy Board and its working co-ordinating agent, the Joint Army and Navy Planning Committee, has been made possible by the formation of the two original planning and operating instruments of the Army and the Navy, the General Staff and the Office of Naval Operations, and the two services are for the first time in their history ready for constructive work along



the lines of co-ordination of plans and co-operation in carrying out such plans in peace and war.

This co-ordination has produced a well-defined policy as to plans and a good start has been made in constructive work on such co-ordinate plans, but as yet but little has been done toward co-operation in training the two services with a view to fitting them to carry out such plans. Each service is so fully occupied with training along the lines pertaining to the action of the individual service that there appears to be but little time to give to co-operative training, yet such training is a clearly indicated necessity; however good the plan may be, the plan alone is not enough, there must be actual maneuvers conducted by combined military and naval forces to test the details of the plans of action, to familiarize the services with the objects and aims of the plans, and to accustom the component parts of such combined forces to the nature of the teamwork required.

#### THE PANAMA CANAL

The project of an inter-oceanic canal to connect the Atlantic and Pacific oceans by means of a trans-isthmian waterway across the narrowest portion of the western hemisphere at Panama was advanced soon after the discovery of the Pacific by Balboa, and the first survey of the isthmus with such an end in view was made as early as 1534. After long discussion of the subject a French company began the actual construction of the Panama Canal in 1882, with the great engineer de Lesseps, who had built the Suez Canal, as its guiding spirit.

The French company failed, due to climatic conditions and lack of any proper sanitation and the resultant losses by disease in the construction personnel, as well as to lack of funds and the misappropriation of the funds provided, and in 1903 the United States government undertook the construction of the canal, purchasing the rights and works of the original French company. The Panama Canal was completed and opened to traffic in August, 1914, and has been in operation since that date.

From a naval standpoint the most important question connected with the canal is as to its use as a means of transferring the fleet or portions thereof from one ocean to the other, especially in war; and from a military standpoint the most im-

portant question is the one of fortifications and mobile defense forces which will deny the canal to the enemy and thus insure its use to our naval forces whenever the necessity arises. The Clayton-Bulwer Treaty between the United States and Great Britain, ratified in 1850, provided that the canal should not be fortified, and at that time it was contemplated that the construction of the canal would be a joint enterprise of Great Britain and the United States. The Hay-Pauncefote Treaty, ratified in 1901, however, contemplated the construction of the canal by American enterprise alone, and, abrogating the first named treaty, granted to the United States the right to take such means as might be necessary for the military protection of the canal.

One of the great arguments advanced by the American advocates of a Panama Canal was that it would afford a ready means of transferring the forces of the Navy from one ocean to the other without the long voyage around South America and thus obviate the necessity for two separate and distinct fleets, one in the Atlantic and one in the Pacific. It was early recognized that to ensure this naval use of the canal in time of war it would be necessary to fortify and garrison the Canal Zone in preparation for eventual hostilities. By some the idea was advanced that this military protection for the canal should be furnished principally by the Navy, but the "Blue Water School" of naval students, who advocated a fleet that would be free to proceed to any waters to meet the enemy fleet and not be tied down to any particular locality as a coast defense force, were able to show the fallacy of the attempt to give the canal the needed military protection by ships permanently stationed at or near the entrances to the canal.

The result was that strong fixed defenses have been provided for the Panama Canal and a considerable permanent mobile force is stationed within the Canal Zone to support and protect the fixed defenses. However, the Navy still remains the "nation's first line of defense," and as such its duty is to prevent, if possible, an enemy fleet or attacking force from a near approach to the canal.

Here, then, is a concrete example of combined action on the part of the Army and the Navy in the defense of a vital element in the military defense of the nation, where co-ordination of

plans and co-operation in action of the two services is absolutely necessary to secure efficient and satisfactory results.

In addition to the forces of the Army allotted to the defense of the Panama Canal there is provided a local naval defense force consisting of submarines, patrol vessels, destroyers, and light cruisers for observation off shore.

The docking, repairing and refuelling facilities of the canal are provided primarily for the use of the merchant ships using the canal, but all of these facilities are also available for the use of the vessels of the Navy in peace or war as may become necessary, and the canal is therefore capable of being used to a considerable extent as a naval base. The close connection at Panama between the activities of the Army and the Navy are such, therefore, as to require especial co-ordination between the services in both plans and training looking to the successful operation in war of this great link in the national defenses.

#### THE HAWAIIAN ISLANDS

Prior to 1893 the Hawaiian Islands constituted an independent kingdom under a native monarch, a sort of last survival of the ancient conditions under which the scattered islands and archipelagos of the vast Pacific existed as self-sufficient communities with little or no intercourse or dependence upon the rest of the world, but in that year Queen Liliuokalani was deposed by an almost bloodless revolution and the irresponsible native government was superseded by a provisional government led by the foreign element, largely American. A republic was proclaimed in 1894, and the islands were finally annexed to the United States 1898, largely as a result of the necessities strongly accentuated by the campaign of that year in the Philippines. Prior to the acquisition of the islands by the United States, students of naval strategy had realized the great importance of these islands in the control of the Pacific and they were variously referred to by the writers of that period as the "Key to the Pacific" and the "Cross-Roads of the Pacific," depending upon whether the writer viewed the subject from the standpoint of purely naval strategy or from the standpoint of commercial strategy.

Following out the line of thought thus engendered, the naval authorities advocated the establishment there of a first-class naval

base as a position from which the fleet might operate in the Pacific at a distance from the homeland Pacific coast and as a stepping-stone on the route between our west coast and the proposed Panama Canal and the recently acquired territory in the Philippines. The establishment of the naval station at Pearl Harbor followed and since then constant attempts have been made by the Navy to secure appropriations of large amounts of money required to carry out the project of making this position into a first-class operating and repair base for the fleet, so far without avail except for the construction of one large drydock and a few repair shops and facilities.

At first it was advocated to make the defense of Pearl Harbor entirely a naval affair, but it was soon evident that the force required would be much larger than the Navy and Marine Corps could furnish without tying up a large proportion of the available naval force in the defense of one locality, thus running counter to the principle that all naval main forces should be primarily mobile forces. Therefore, the permanent land defenses of the naval base at Pearl Harbor were entrusted, quite properly, to the Army. The forces now employed for this purpose are considerable and should be materially increased if the position is to best serve its full purpose.

However, it should be borne in mind that the reason for the defense of any position in the Hawaiian Islands is entirely a naval one, its value to the United States in war being as a base for the naval forces operating in the Pacific, denying the position to the enemy being only a secondary consideration. Here, then, is a typical case of active co-operation of the Army and the Navy in a definite operation where the joint mission of the two services is clearly indicated and understood. Assuming that the planning activities of the two services have fully covered their part of the work, both as to the action contemplated on the part of the services individually and in co-operation, it remains to so co-ordinate the training of the two services in peace that they may be in readiness to properly carry out their mission in war.

In general, the defense of an island position requires the defense of the island as a whole, meeting the enemy at the points of landing, where his tactical deployment would be most difficult, his forces most liable to be thrown into confusion by the attack

of the defenders, and his efforts at consolidating any position he might gain would be most difficult. There is nothing to indicate that the island of Oahu is an exception to this general principle.

The defense of an island naval base normally presupposes active co-operation of the land defenses, fixed and mobile, and the naval forces afloat allotted to the local naval defense of the position. The two forces have the same mission and no question of command, sphere of influence, or separate plans of action should be allowed to interfere in the slightest with the fulfilment of the main mission.

To capture an island position, assuming that it has been properly fortified, garrisoned, and supplied, requires the transportation of a sufficient landing force overseas under convoy of a naval force large enough to insure protection from the enemy naval force that may attack the expedition en route, a forced landing on the island against determined opposition, the consolidation of the positions gained on the beach, and finally the investment and capture of the positions occupied by the defending forces. During these operations the naval defense forces acting in co-operation with the land defense forces of the island would operate against the transports, the ships of the convoy, and the boats used in effecting an actual landing.

In any war overseas our Army and Navy may have to act in the capacity of defenders of such island positions and also as the attackers of such positions. In the first case co-operation of all of the forces, be they of the Army or the Navy, is a requisite to success. In the second case, the attack of a fortified island position, the remarks of Colonel Furse, quoted above, are particularly applicable and clearly outline the broad principles to be followed as to command and control by the army and navy commanders of the attacking forces. But however good may be the intentions of the two commanders, many questions will naturally arise in the future, as in the past, as to the application of such broad principles to special cases and situations. Actual maneuvers of combined army and navy forces in overseas expeditions for the attack of fortified island positions, simulating the conditions of war insofar as it is humanly possible to do, would serve to bring to light many of the points of irritating contact and the solution of the problems thus presented in maneuvers would

serve as a basis for plans in organization, command, and execution which would go far to smooth the way should it become necessary to carry out such operations in war.

Such combined maneuvers would give the troops engaged in the expeditionary force valuable training in all the elements of the preparation required for such an expedition, the experience of actual transportation overseas under convoy of a naval force in the face of enemy activity at sea, and training in landing against the opposition of an active enemy on a hostile coast without the use of wharves or docks; while the defending side would be afforded an opportunity to test out their theoretical plans for the defense of the position insofar as might be possible short of actual war conditions.

From such maneuvers the Navy would also gain experience in the different phases of the operation, the embarkation of the troops, the stowage of material and supplies, the protection of the convoy at sea against simulated attack by cruisers, destroyers and submarines, the landing of the expeditionary force upon a hostile shore against determined opposition, and the support of the shore operations after a landing has been effected.

The psychologic factor should not be lost sight of in carrying out such maneuvers. It is a fact, frequently brought out in academic studies and war games at the military and naval colleges, that the two services lack intimate knowledge of each other; the Navy is not intimately acquainted with the powers and limitations of the Army and the converse is equally true. The intimate association resulting from several weeks spent in combined maneuvers of this nature would serve to educate and indoctrinate both services in what we may style the art of co-operation, it would give each service an opportunity to see the other service "in action," and it would tend to establish a common ground of understanding which would increase mutual acquaintance and respect and do much to smooth out the rough places that have been stumbling blocks in past campaigns.

The great cost of carrying out such maneuvers on a scale that would simulate actual war conditions with a first-class naval and military power appears as the greatest practical obstacle to the immediate prosecution of the plan above outlined, especially in this era of enforced economy and limitation of armament; but

in reply to this objection it may be stated in time-worn phrase, "one cannot make omelets without breaking eggs."

### COAST DEFENSES AND THE NAVY

The first battleships for the "New Navy," the *Maine* and the *Texas*, whose construction was authorized by Congress in 1886, were designated as "coast defense battleships." This was in accord with the idea of a Navy for the defense of the harbors and coasts of the United States rather than for distant service on the high seas, but such a Navy would practically constitute an adjunct of the Coast Artillery defenses and would be tied to the harbors it was designed to defend.

Opposed to this idea of a purely defensive Navy for the protection and defense of designated localities was the "Blue Water School" of naval officers, who advocated a deep sea-going Navy designed with great cruising radius to search out and give battle to the enemy fleet wherever it might be found on the seven seas. They advocated "command of the sea" as the best aid a Navy could give to the defense of the homeland and insisted that a fighting fleet must be above all else a mobile force. The "Blue Water School" won in this controversy and it is now universally accepted that the Navy shall not be weakened by detachments from the fleet of main elements for the defense of harbors and special localities. The mission of the Navy is now well understood to be, "To gain command of the sea and keep it."

It is still necessary, however, to have certain classes of naval craft assigned to assist in various ways the harbor and coast defenses of the Army. Such forces, known as naval coast defense forces, consist of patrol vessels, naval aircraft, mine layers and sweepers, and coast submarines, and their part in the general scheme of coast defense is clearly laid down in the instructions for joint Army and Navy action in coast defense.

It was at the harbors where fixed defenses manned by the Coast Artillery of the Army existed, and which were frequented by the ships of the Navy, that the Army and the Navy came most in contact in peace times, and as the Navy was called upon to furnish the naval coast defense forces for such harbors it was here that the need for army and navy co-ordination in plans and training appeared to be most imperative.

Questions as to jurisdiction, command, ways and means of defense, and assignment of areas of control in connection with the coast defenses arose and were referred to the Joint Army and Navy Board from time to time after its organization in 1903, and from the consideration of these questions there resulted the establishment of defensive sea areas with rules for the Army and Navy duties pertaining thereto. These rules and regulations showed the lines along which the training of the two services should be conducted in order to secure effective co-operation in the defense of the coasts and harbors, especially of those harbors in which were located navy yards or naval stations or bases. This constitutes the first instance of co-ordination in plans of the Army and Navy in modern times.

The action of fixed defenses is limited to the range of the batteries and as a rule fixed defenses are most vulnerable to attack from the rear or landward side, and for this reason they must be supported by a mobile force to meet attack from the landward side. The purpose of fixed defenses is met if they are sufficient to force the enemy to land at a distance from them and invest them from the landward side, and to accomplish this they must be strong enough to ward off an attack by the enemy fleet. It is the mission of the Navy to meet the enemy fleet, defeat it away from our own coast, if possible, and gain command of the sea which will enable us to despatch an army expeditionary force overseas to invade the enemy territory and give the finishing stroke, as contemplated in the remarks of Sir Cyprian Bridge quoted at the beginning of this paper. But the fleet may be temporarily absent in distant waters, thus giving the enemy an opportunity to land and invest the fixed defenses of an important harbor, as has frequently happened in past campaigns. In such event the co-operation of a mobile force on shore becomes imperative. This is stated here to show the necessity, first, for co-operation between the Navy and the coast defenses; second, between the coast defenses and the mobile Army; and third, between the three forces involved in the operations.

Having these objects in view, at various times maneuvers were carried out by squadrons of the fleet and the coast defense forces to demonstrate the action to be followed in naval attacks on fortified harbors on the one hand and the best means to meet such



an attack on the other hand. In 1900, at the instigation of the Naval War College, the North Atlantic Squadron made an attack upon the shore defenses of Narragansett Bay. Little resulted from these maneuvers but they were a start toward combined training of the Army and the Navy.

In 1902 combined maneuvers were held between the North Atlantic Squadron and the shore defenses of Narragansett Bay and the eastern entrance to Long Island Sound in accordance with a prearranged plan, the details of which are given in *Rules for Army and Navy Manœuvres in New London and Narragansett Artillery Districts, 1902*. The general idea of this maneuver was stated to be, "anticipating the declaration of hostilities, a strong enemy's fleet (without torpedo boats) determines to make a sudden dash upon Newport, or the eastern entrance to Long Island Sound, to secure a naval base, taking advantage of the absence of a declaration of war to find the land forces somewhat unprepared," and it was also stated in the rules that "the controlling idea should be to test the training of the personnel and the efficiency of the matériel."

In 1903 the rules for the maneuvers of 1902 were revised in the light of the experience gained and maneuvers were held on the Maine coast involving an attack by the North Atlantic Fleet upon the defenses of Portland. After this the rules were again revised and in 1905 joint maneuvers of the North Atlantic Fleet and the Coast Defenses at Hampton Roads were carried out, the employment of searchlights, range finders, and smoke screens being specially demonstrated. In 1913, plans were made for extensive joint maneuvers at Panama but were not carried out for lack of funds and other causes.

All of the foregoing joint maneuvers and exercises as well as some others of a lesser character involved the training of the Navy in the attack of fortified shore positions and the Army in the defense of such positions, but did not go into the wider general field of joint action of the Army and Navy. The experience obtained in these joint exercises and resultant studies of the subject have been embodied in rules for joint army and navy action in coast defense, outlining the lines of preparation and action to be followed by the forces of the two services engaged in coast defense at home and abroad and giving the limits

of authority and control for the two services in the common undertaking.

It appears to be well settled that the ships of the first line of the fleet would not be used in an attack upon coast defenses, at least so long as there is an enemy fleet in being which might have to be met in the war, but this general decision does not preclude the use of special ships and second line ships for attacks of shore fortifications if special situations indicate a probable gain from such action commensurate with the risks taken. The use, however, of any class of naval vessel available to support an army landing for the investment of a fortified harbor or position would not be considered an infringement of the general rule, and for this purpose joint maneuvers of capital ships in connection with army landing forces are still desirable.

The naval vessels assigned as a part of the naval coast defense forces belong just as much to the particular harbor or position as do the fixed batteries and their garrisons and as such their training should be carried on at all times in connection with the training activities of the land forces assigned to the harbor defenses. In no other way can both services determine the lines of action to be followed in the joint action that will be imperative to insure satisfactory results under the stress of actual war. Here, as in other situations requiring joint action, indoctrination, mutual trust and respect, and the ability "to speak the same language" is the requirement and these desiderata can be met only by joint training.

#### THE NAVAL ADVANCED BASE

The mission of the Navy, as stated above, is "To gain the command of the sea by operations against the enemy fleet." To carry out this mission the fleet must first search out the enemy fleet and engage it in battle and to do this the fleet may have to go far afield from its home bases. Ships cannot keep the sea indefinitely, they can only steam so long as their fuel supply lasts and must then seek a refueling station in some conveniently located port; if far from their home bases they must either use their permanent bases near the scene of the operations or take steps to provide temporary or advanced bases in the theater of operations to refuel, revictual, and effect such minor repairs as

are from time to time required to keep ships and crews in condition to fight.

Consideration of these requirements led to the plan for establishing Advanced Bases in the theater of operations whenever such action should be required due to operations of the fleet at a distance from the home bases or from permanent outlying bases. The reasons for such advanced bases, the methods by which the Navy has planned to provide them, and the means for their defense against raids by enemy cruiser forces, have been determined and form a part of naval indoctrination. These naval advanced bases will be established entirely for the use of the fleet in war and in effect they constitute a part of the fleet itself, and for this reason their defense is to be undertaken by a part of the naval forces especially trained and equipped for this duty, namely, the regularly organized Advanced Base Forces of the Marine Corps.

The mission of the Marine Corps, as a part of the active Navy, is "To support the fleet, or any part thereof, in the accomplishment of its mission," and one of the best means by which the Marine Corps can carry out this mission is in the defense of the naval advanced bases required by the fleet. This duty has been assigned to the Marine Corps as an integral part of the Navy on account of the fact that this corps possesses the flexibility of organization required for the duty, the mobility by sea gained by service in the seagoing ships of the Navy, the special training necessary to carry out the task, and as a part of the Navy it can perform the duty without giving rise to questions of unity of command which is an absolute requirement for the successful operations of the fleet.

When the Navy has gained command of the sea by defeating or containing the enemy fleet to such an extent as to justify the despatch of an army expeditionary force overseas, the Marine Corps advanced base forces may be re-embarked for further duty with the fleet at more advanced positions, turning over the occupation of the original bases to the Army, if such occupation will be required as a part of the army lines of communication.

From time to time since the inception of the advanced base idea in 1900 regiments and brigades of Marines have engaged in combined maneuvers with the fleet to fit them for the duty above

required; these exercises embracing the fitting out and embarkation of the advanced base forces in naval transports and the ships of the fleet, the voyage to some suitable locality, the landing there, and the fortification with guns and mines of the selected position. Much valuable experience has been gained by these maneuvers, the results of which should be of value to the Army in its preparation for landing operations overseas, and an elaboration of the methods employed, on a much larger scale suited to probable army conditions in large overseas operations might be worthy of consideration in connection with combined training of the Army and the Navy in preparation for such operations. The cost of fitting out and transporting overseas to some suitable locality of a large army expedition, say one or more complete divisions at war strength, would be large, but when we consider the value to the nation that would accrue from the actual experience of fitting out, transporting and landing such an expedition and in the simulated land operations with the aid of the Navy after a landing had been effected, it would appear that the expenditure would be fully warranted.

The recent experience gained by the Army in transportation across the Atlantic during the World War has given its personnel valuable training in seagoing, but it should be remembered that this movement overseas partook of the nature of passenger transportation on a large scale from well-organized and provided embarkation ports in the United States to almost equally well-fitted ports on the other side. Under other war conditions that will probably arise in future wars it may not be practicable to land an army expedition at the well-equipped docks of a suitably located port in enemy territory. Such ports will probably be denied to us by the enemy, necessitating a forced landing at some port not well provided with docks and landing machinery, or possibly at some point with no facilities at hand where men and stores will have to be landed on a beach in ships' boats against enemy opposition, under the protection of the fire of the ships' batteries. The only way to prepare for such a landing is by actual exercises which will serve to train officers and men in the required details of operation.

The British landing at Gallipoli is one which may be cited to illustrate what may be demanded in a future war, and if its

fatal mistakes can be corrected by proper training maneuvers we may gain the experience which will spell success instead of the defeat which met that expedition. However complete in every detail the plans for such operations may be, plans alone are not sufficient; actual training at maneuvers carefully following out the details of the prearranged plans will serve not only to test the correctness of the details of such plans and to correct discovered defects in the plans, but will also indoctrinate the leaders on sea and land as to their individual and collective tasks and give every officer and enlisted man an illuminating personal experience in the difficulties to be encountered.

The increasing importance of aircraft in such operations, both for the attack and the defense, is the most important new development having a direct bearing on combined landing operations, and the proposed combined maneuvers would give valuable experience to the naval air forces in operating from the aircraft carriers of the fleet and to the land air forces in meeting such forms of attack.

#### CO-OPERATION IN MOBILIZATION AND PRELIMINARY TRAINING

In the last war the Army and the Navy both created large cantonments or stations for receiving the recruits and for the preliminary examination, classification, and training of these recruits, the recruits being at first received from voluntary enlistments and later from the local boards operating under the Selective Draft Law. This resulted in considerable duplication of effort which could be avoided in future wars of large magnitude by plans for effective co-operation at this stage of national preparation for war employing the available manpower of the nation.

To anyone acquainted with the systems employed by the Army and the Navy in the first treatment of recruits and in what may be termed their elementary training, a striking similarity appears. In both services the system of segregation was the same, the men were thereafter divided into companies after the same general scheme, and it was only after the training had passed the preliminary steps that any marked differences appeared.

Such duplication of effort and its consequent additions to overhead expenses adds to the money required as well as to the number of instructional units. This being the case, it may be

practicable to give all recruits for both the Army and the Navy, in time of war or great emergency precedent thereto, their preliminary training at the same cantonments, still leaving to each service the specialist training later required. If so, the saving in time, money, and personnel would appear to justify a careful study of the possibilities. Under such a system, to secure a proper distribution of the men to the two services, officers from both the Army and the Navy should be included in the personnel of the cantonments designated for the reception and preliminary training of wartime recruits and assignments to the different services should be made with due regard to aptitude for the service and the personal preferences of the men when practicable.

#### EXCHANGE OF OFFICERS

In the past the average army officer has had but little acquaintance with the doctrine, training, and life of the Navy or with its limitations and powers of action, and the converse is equally true. Circumstances of service during long periods of peace and even in war have not brought the two services much in contact. The results of this lack of acquaintance between the services have been productive of misunderstandings and disagreements in the campaigns of the past, and history abounds with examples of lack of efficient co-operation traceable to this cause; such as the lack of co-operation between the Army and the Navy on the Mississippi River during the Civil War and the misunderstandings that arose during the Santiago campaign of the Spanish-American War.

As a means of correcting to some extent this fault in the basic education of officers to fit them for command in combined operations in war, it is suggested that a system of temporary exchange in service might be devised which would give at least a few of the officers of each service an opportunity to observe the daily routine of the other service and thus to learn at first hand the powers and limitations of the elements of that service and the methods of its employment toward the common end, victory for the nation in war.

By such a system officers of the Army would be assigned to temporary duty in the active fleet and naval officers would be

assigned to shore duty in the Corps Areas of the Army and with the larger tactical army units. This is already accomplished to some extent in an educational and theoretical way by the assignment of officers of the Navy and Marine Corps to the classes of the Army War College and of army officers to the classes of the Naval War College.

It is a far cry from the "roaring forties" to the "rolling prairies" of Kansas, but as Admiral Luce so aptly remarked in his outline of the first session of the Naval War College, "the military principles underlying war ashore may be applied to war on the sea." This rule, now known as the "Luce idea," was the foundation of much of the constructive work of the Naval War College, and the detail of a limited number of officers of the Navy and Marine Corps to the Army Schools at Fort Leavenworth would be in furtherance of the "Luce idea," and would give these officers a first-hand knowledge of the Army and its methods which would be of great value during combined operations and even in their application to purely naval problems.

The exchange of officers between the two services as above suggested would in time give to each service a considerable number of officers having such a first-hand knowledge of the sister service as would fit them for general staff duties in forces engaged in combined operations of training in peace and the real thing in war.

#### OCCUPATIONAL SPECIALISTS

The methods of the selective draft employed during the World War brought out the great value of a proper distribution right from the start of the so-called occupational specialists. The classification of the draft local boards showed the occupation, profession or vocation of the draftees, but owing to the shifting of population these records are of little use for the future, and it has been urged that a military census of the available manpower of the nation be taken by districts and kept up to date annually in order that they may be available for assignment to the Army or Navy, where most needed, in time of war or the imminence thereof. Such classifications are now being made to some extent, but both the Army and the Navy are engaged in the work and there must come a consequent duplication of effort with lack of efficiency in the hour of need.

It is assumed that all military students of the subject will agree that a selective draft law should be enacted *before* a war occurs in order that the preliminary lists and classifications may be ready on or before a declaration of war. This would save months in the mobilization, prevent the dislocation of industry incident to a voluntary system of enlistments on a large scale in the early days of a war, and make it possible to send the fleet to sea and put the armies in the field at full force shortly after D-day.

With the present prevalent ideas of our people, however, this seems too much to hope for, but by proper co-ordination of army and navy effort in this direction all available vocational specialists could be listed and classified and tentatively allotted to the service where their services would best serve national rather than purely service ends, having due regard for priority of employment of the services.

It has been proposed that the Army make lists of occupational specialists by Corps Areas and have them ready for assignment to the various arms of the service in such areas. Having only the needs of the Army in view such a plan would meet the requirements, but the Navy in its rapid enlargement from peace to wartime strength on the eve of war will require a large number of these occupational specialists, machinists, engineers, artisans, and electricians for immediate service in the active fleet and its auxiliaries, and as such they can be of immediate use in the Navy with but little strictly military training, whereas for the Army they would require a regular course of military training in addition to their occupational ability already acquired.

In war against a nation having a large active navy our own Navy must be brought to full fighting strength in less time than can be given for the same purpose in the Army and every effort must be made to place the Navy on a war footing before or on D-day. To do this the peacetime personnel must be rapidly augmented by mobilizing available reserves, re-enlisting former service men, and enlisting new recruits who may have had little previous training for naval duties. Large numbers of additional specialists in various lines will be required for immediate service and the occupational specialists to supply these requirements should be at once assigned to the Navy, where they can be of



first service to the nation; the question of priority here is a national one, not a service one. Such action would conduce to the best interests of the nation in making the Navy available for service at full strength as the "first line of the nation's defense" in the shortest possible time.

In this, as in practically every feature of the procurement of personnel and material for the national service in time of war or emergency, the zeal of each service and arm of the service to fill its own requirements as soon as possible results in a competition and rivalry that does not work for efficient co-operation, economical administration, or the best and quickest mobilization of all services and arms. Under the voluntary system of enlistment this rivalry and competition is good since it stimulates the public interest, increases publicity required to arouse the enthusiasm of the multitude, and tends to bring *esprit de corps* to a high standard. Under the compulsory service system of mobilization these features are not so requisite and a more businesslike method can be followed, namely, the assignment of the individual element to the service and arm of the service where he can perform the best service and where his services are most required.

#### CO-OPERATION IN PROCUREMENT OF SUPPLIES

There is one subject vitally connected with the prosecution of successful warfare on an unlimited scale which prior to the World War had received but little consideration as regards the effect upon it of efficient co-operation of the Army and the Navy; this is the procurement of all classes of munitions, supplies, and provisions required to fulfill the mission of the nation in war.

In all previous wars the two services had each operated its own agencies for the procurement of supplies, co-operation being almost entirely lacking. This frequently resulted in duplication of effort, increased cost, oversupply in each service of some articles at the expense of a shortage in such articles for the other service, and in general a marked increase in the total expenditure under that indefinite but immense item customarily termed "overhead expense."

Where two grand departments of government operated independently with no deciding power short of the President acting as Commander-in-Chief of the Armed Forces of the nation, it

was frequently impracticable or impossible to refer questions of this nature to the President as they arose in the haste and waste of wartime procurement on a large scale engendered too often by an utter lack of foresight in times of peace. Whether or not the proposed scheme of uniting the War Department and the Navy Department under one government department of National Defense will be a cure-all for the difficulties that have arisen in the past remains to be seen; but it is a fact that very early in course of the preparation for our part in the late world-wide conflict it became evident that the procurement of those classes of supplies which would be required by both services must be made a national and not a service affair. There resulted the establishment of numerous wartime agencies for the general procurement and allotment of such munitions and basic materials according to priority tables worked out under the stress of actual necessity.

It appears to be evident that much time and money and labor could have been saved by a united effort prior to our entry into the war, and in this fact lies the guide for future action. That this guiding principle has not been followed since the close of the war will scarcely be questioned. There are still cases of the two services practically entering in competition into the commercial field to obtain necessary supplies, with the consequent duplication of effort and increase in cost.

To avoid this it is suggested that a plan for co-operation of the Army and the Navy in the procurement of all basic supplies and materials would obviate the difficulties to a great extent and would also afford excellent training in peace for the course of action that would of necessity have to be followed in war upon an unlimited scale. As appropriations become less without a corresponding lessening of actual requirements if we are to keep up a state of preparedness the necessity for economy becomes greater, and the stress laid upon the utmost economy in many recent general orders of all of the services only accentuates the need of the co-ordination of effort here advocated.

#### CONCLUSIONS

In the past there has been but little co-ordination in plans and co-operation in training involving the joint action of the Army

and the Navy in tasks where both have important parts to play, each within its own sphere. In recent years the machinery for co-ordination of general and special plans has been provided, consisting of the General Staff for the Army and the Office of Naval Operations for the Navy, with the Army and Navy Joint Board as the duly constituted co-ordinating agency where the points of contact may be discussed and the mooted questions decided for the common good.

Assuming that these agencies will succeed in the field allotted to them the further action indicated is combined training in actual maneuvers simulating the problems that would arise in war. Such maneuvers should consist of the three steps in such operations; namely, the embarkation of an army force in transports, the voyage overseas under convoy of the Navy, and the landing on a hostile coast against strong opposition using the facilities carried with the expedition and not depending upon elaborate harbor facilities.

The deficiencies in personnel, material, and individual service training disclosed by such joint maneuvers and exercises should be used as a basis for studies of means to eliminate the deficiencies, the results of such studies being used as guides to the changes required in routine training, design of material, and methods of planning.

Co-operation in peace time in the procurement of basic materials and supplies for the Army and the Navy would result in proper training in this respect to meet the emergencies of war.

Co-operation in plans for the assignment of recruits to the two grand branches of the national defense on a basis of aptitude for the service and for the preliminary training of all recruits obtained from the operation of a selective draft law would result in a saving in time and money, the former being the most important in war and the latter being a continuing factor when the bills have to be paid after the war has been won.

Assignment of a few officers of the Army to duty in the active fleet and of a like number of officers of the naval service to duty with the larger tactical units of the Army would tend toward acquaintance and mutual respect which would come from the

knowledge gained as to the limitations and powers of the sister service.

Assignment annually of a larger number of officers of each service to the classes at the War College of the sister service would also serve to increase the acquaintance and mutual knowledge which will enable the two services to speak the same language, enlarge their mental horizon beyond the confines of their own service, and get a first-hand view of the psychology of the other service.

In order to secure local co-operation in training in those areas where forces of the Army and those of the Navy are engaged in a common mission of defense or offense, local joint committees should be organized to aid the Army and Navy commanders at such stations in co-ordinating the plans and training of their forces in such manner as will, under the conditions locally imposed, lead to a common indoctrination of the forces and produce definite results for good in war.

Centralization in planning is desirable to secure uniformity in indoctrination and a general scheme of procurement for manpower and material, but plans for local combined action can frequently be best worked out right at the scene of future action; this applies especially to permanent positions where the defense is composed of land forces and also of naval defense forces permanently assigned and not a part of the high sea fleet.

In training, however, decentralization is desirable in order to give the commanders in the field or on the sea the opportunity to conduct the training maneuvers of their forces, whether conducted independently by the particular service or in combination with the other service. The results of such training may then be available for use in confirming or revising the centrally devised plans for future training and for actual wartime operations.

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## A PLEA IN DEFENSE OF PAPER-WORK

BY LIEUT. C. C. CARMINE, U. S. NAVY

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Opinions upon the relative merits of this or that system of training for the attainment of any given object or state of efficiency must be admitted in our naval service to be of a widely diverging nature. Take for instance the contemplation of a change in the present system of promotion, or the value of speed as compared with armor, the strategy and tactics of Jutland, the naval policy of Britain during the war—all these and many others have oftentimes been subjects for after-dinner discussion in the messroom; that is, when the presence of visitors does not necessitate the courteous dismissal of shop-talk.

Now gather together a group of executive officers, navigating officers, gunnery officers, first lieutenants and engineer officers and see how easy it is for one's point of view to be colored by the particular duties over which he has cognizance. To be more specific, suppose someone at the gathering were to suggest the desirability of doing away with the paper-work connected with target practices; the reports, the computation of scores, the suggestions—what would be the consensus of opinion?

It seems that when Battleship Division Nine first joined up with the British grand fleet, to form a separate fighting unit in the eventuality of a clash with the rehabilitated high seas fleet, informal target practices demonstrated the inferiority of our own vessels in gunnery. This has been a persistent rumor throughout our service which it seems has been neither affirmed nor denied. At least any doubts about the comparative efficiency of those vessels has been dispelled with the knowledge that we were not lax in installing new and needed fire control appliances,

in adopting British contrivances and methods where demonstrably better, and by ultimately rivalling and even surpassing the performances of the crack vessels of His Majesty's royal marine. The outstanding feature of that remarkable improvement in a great many of the minds of our own officers lies in the fact that but little detailed data was taken and no searching analyses made of results. Ships simply went out and fired and were observed if practicable. The British vessels, so it is said, would merely offset their deflection and fire at a neighboring vessel as though it were a target; never bothering about observers, times, checksighting, safety precautions and the like. If this were all true it might indeed be considered no less than marvellous that progress and improvement should simply have resulted from the successive shooting of guns without any data or analyses upon which to base a comparison of dispersions of guns, patterns of batteries, efficiencies of fire-control parties, etc.

It is known, however, that the British did have a modified system for recording observations of target practices in use during and before the war. Their dispersion under service conditions is less than ours and this fact was only established by the aid of definite information obtained during firing. If they did not have an elaborate system such as our own, looking at the same question from another angle, who is to say that the introduction of a great number or all of its features into the British navy during the period of gunnery training before 1914 might not have been very desirable judging by later eventualities? Would a personnel which had been indoctrinated with the necessity for an unqualified observance of safety precautions, an item which is observed rigidly in our own service both as regards omission and commission, have suffered the loss of a *Queen Mary*, an *Invincible*, and *Indefatigable*? Might an analysis of plotting and fire control methods by competent observing parties in reports to the admiralty and the dissemination of this information to the service in years preceding June 1, 1916, have caused the British vessels to straddle on the first or second salvo instead of being smothered by enemy projectiles immediately after opening fire with the consequent loss by gunfire of two capital ships before the battle had half begun?

Let it be remembered that we are not as yet thoroughly conversant with the German methods of preparation for battle, their system of target practices and competitive gunnery training, but we do know that their shooting was quite remarkable in the opening stages of the greatest of modern naval engagements.

For the benefit of those who insist that a possible hit or miss method of recording gunnery progress has produced better results than one having the features of statistical comparison our own Rear Admiral Sims, a great admirer of the British service, has written much which tends to confirm the merit of the latter. He has compared the shooting of the British ships at Coronel, Falkland Islands and Dogger Banks quite unfavorably with the results of our own target practices during the interim. It is safe to state that an analysis of Jutland would further support a bias in favor of our system. From the reports of our own target practices it is known that our fire control is far from perfect but it took an actual encounter with the enemy to demonstrate the same fact to our friendly rivals across the sea.

Each and every vessel that has been in commission any length of time has these reports, some as far back as 1910—data capable of analysis for the detection of errors, but it is known that in many cases little or no attempt is made to make use of them in a comprehending manner. What progress has been made along the lines of record-keeping has been the outgrowth of the efforts of a few who have understood its value and have refused to be swerved from the path by the cries for mercy of the "practical" men. At the present time when the idea of a system of taking and compiling data is gaining a little ground in the service and is being firmly lodged in the minds of the thinking officers, when the office of the Division of Gunnery Exercises and Engineering Performances is beginning to perform work of real value there arises the slogan "Cut out the paper-work!" The feeling is not wide-spread but it lies dormant in the minds of many ready to follow a leadership which coincides with their views. Organized and spurred to action this majority might easily cause the abolition of our present system. It is too bad that they would not investigate the pro and con of the question before becoming dogmatically

prejudiced, but it was ever thus. There are always thousands of sheep to one shepherd, hundreds of eight-hour workers to one eight-minute thinker.

Farragut said "Damn the torpedoes; full speed ahead!" but he must have chuckled when he knew that the state of the tide and the position of his vessels was such that there could never a mine have touched them. Careful thought and planning based upon accurate records brought to him by his reconnoitering party had formed the groundwork for his decision to attack. Does anyone doubt that Dewey knew the state of the defences at Manila Bay and the condition of the Spanish fleet before forcing an entrance? Records! Records! Records!

It has been assumed by a great many well-meaning officers that the only people under Heaven's blue sky who have any interest in all the sheets and sheets that go into the department after a practice are the ordnance highbrows who pore over a layout of cross-section paper or maneuver a slide rule with consummate skill. There has been and is a tendency to believe that the recording of all the data taken at a practice is purely and simply for the accommodation of the swivel-chair people in Washington. The extreme of this view is registered in the "wolf" cry of "bureaucracy." This fact is evidenced so many times in the demeanor of officers and men on an observing party who perhaps are required to arise at five-thirty A. M. in order to record the time of the whistle, or the first salvo, as some would have it "the number of guns in a turret." If those persons ever took the trouble to compile the records and scores and analyze the data with a systematic effort to establish the reason for each shot or salvo missing the target and had to deduce results from a set of statistics which, compared to the famous Labyrinth, are but as a pebble to the Rock of Gibraltar—they might be inclined slightly towards a spirit of tolerance.

In the first place a person with the above-mentioned restricted viewpoint does not thoroughly understand the real value of the office and personnel who compile and disseminate the information on gunnery performances of vessels on active duty. They do not appreciate the importance of the functions of this central statistical office. It is from there that are published the results of practices during previous years so that standards



may be set which will measure the success or failure of a practice of today. That is the *raison d' être*, as the strategists would have it, of this office—to publish comparisons, stimulate progress through the age-old method of competition. If all this is conceded, a fair question might be asked as to how a fair and accurate estimate of a vessel's, division's, or fleet's gunnery performances can be made unless there is some authentic data taken? Authentic data can only be obtained on the ships, at the guns, the instant they fire or the instant the projectiles land.

The importance of records and information is amply illustrated in a consideration of international, business and social relations. It takes years and tens of years, the devotion of the lifetimes of scientists and scholars to the collection of data, to methods of research and analysis, in order that the truth of a proposition may be established. Their laboratories, libraries, and studies are central offices in which statistics are sorted and stored for reference in the struggle for proof of a theory. Witness a few quotations and concrete illustrations.

As Napoleon lay on his deathbed he is reputed to have uttered the following: "Let my son often read and reflect on history. This is only true philosophy. Let him read and meditate on the wars of the greatest captains. This is the only means of rightly learning the science of war." Reports of target practices are condensed gunnery histories and histories are records in their broadest sense.

Here are significant quotations on the subject of records taken from "Remarks on Full Caliber Practice of the Second Battle Squadron Grand Fleet":

"Records annihilate time and space, bring back the past, and give us dependable glimpses into the future."

"Records warn of wrong methods, unwise procedure, and inefficient operations."

"Records check against extremes."

"Records quickly tell the direction and rapidity of progress."

"Records furnish a basis for all future work."

The correct conduct of military and naval strategy and tactics is so frequently a matter of the victor's superior knowledge of the factors necessary to achieve success as learned from a

study of previous similar or related problems. You have heard the claim of Admiral Von Tirpitz. Had the German strategists properly appreciated the principles unearthed by Mahan in his comprehensive treatises of naval history, and had they adhered to an offensive-defensive campaign on the sea in 1914 and under the sea in 1915-16 who can say what may have been the results? The German staffs had learned the real significance of sea-power and had constructed a truly efficient service in keeping with their national aspirations but there were evidently salient features in the application of sea-power which are made very evident in a close scrutiny of Mahan's works, that, the Teutons had neglected. This is an example of the possible uses of records on a large scale, being international in its scope.

Science furnishes ample proof of the value of records. The toil and worry of a lifetime were spent in the collection of data for the establishment of Darwin's theory of the origin of species. He had to cross continents and explore unknown regions in the interests of research to convince himself and the world of the truth of his hypotheses. Every avenue of doubt had to be closed by conclusive evidence furnished in the collection of statistics on birds and beasts of the earth, on records illimitable until any doubts were buried under a huge mass of proof.

Business furnishes examples almost too numerous to relate of the importance placed upon records. The modern tendency towards standardization and the division of labor has made it necessary to settle on the true value of a day's work. Time and motion studies have been inducted into factories for the purpose of cutting down time and establishing a standard from which wages may be adjusted for a good or fair day's work. Elaborate bonus schemes have been inaugurated in plants and factories for the stimulation of production and the reduction of unit costs of articles. These extra compensation plans and rulings on what shall constitute a fair day's work are based upon the recording of accurate data on the processes involved and the results achieved over a given period. Having established a standard, records are continually kept with the idea in view of modifying standards, changing the systems, increasing production.

Cost finding in business has demanded a strict accountancy of every minute detail which might enter into the manufacture of

a product from the raw to the finished state. Regular departments have been organized with special employees, men of brains drawing down more than substantial salaries, to record and analyze statistics on costs. The literature published on cost finding nowadays is enormous. The business executive is daily confronted with estimates and masses of figures from his cost finding department compiled to prove where this or that item of cost may be reduced or eliminated and profits increased. Business is absolutely shackled, under the influence of statistics.

Verily, verily it is an age of records. The world has come to recognize the tremendous value of detailed information regarding those incidents of lives, those illustrations of steady growth which have characterized progress from the paleolithic to our present "golden age of materialism."

To return to the immediate perspective, the subject of gunnery and target practice reports. We have stated the purpose of assembling and analyzing these in the department to be that of registering comparisons between different units and the setting of standards; but they render a yet more immediate service directly to the vessel which has completed a practice and which retains a copy of the results on file. This fact it is believed has been somewhat overlooked. The average idea of preparation for a practice in only too many cases is to drill and drill diligently up to the day of the event, if possible observe other vessels fire first and learn their mistakes, correct these over night; then shoot, make up the other ship's scores and forward as soon as possible, receive and correct your own scores and forward hurriedly; then cut another notch on the desk and consign the memory of that practice to the shores of the river Styx. The next year the same procedure and so on. How few ever go back to those reports of previous years, pick out, sort, and compile the glaring mistakes which spelled only partial success in one practice and rotten failure in another?

What is the specific value of the copy of the report of scores which remains aboard a vessel other than to carry out the function of any record? What else but to point out the reasons for each and every salvo missing the target, which is the ultimate aim of records in gunnery anyway? Yet one officer after another will wonder indefinitely for years to come why his ship didn't

shoot in such and such a practice when it is put down in black and white if he would only take the trouble to search it out. At this point let it be stated emphatically that the impression is not meant to be created that the causes of misses will be found correct as assigned by the board of observers who make up the reports. That would indeed be a millenium. One only has to witness a board of observers and score-keepers rushing through the papers of a short range battle or director practice to understand how closely they oftentimes analyze a miss. It is too frequently a case of "cause unknown" when the factors which caused the failure to hit are not perfectly evident. At the same time score compilers have a justifiable grievance, for after a ship has once fired and accurate data at a gun or station has not been taken it is many times impossible to be definitely sure of any reason for a miss.

The reports of scores, after final completion, must be examined and analyzed by the ship which has fired and which is the interested party to definitely and conclusively establish the reasons for misses, whether it be pointing, training, sightsetting, plotting, range-finding, communications or any of the host of other details which spell failure to hit. These errors must be collated and kept on file for future reference and comparison. The continuous shifting of the officer personnel necessitates the keeping of permanent records on board vessels to enable newcomers to perceive the mistakes of predecessors. Records are on hand on every vessel, but are they used? The question is not one of their existence but of their use. Nine times out of ten what is considered to be the one panacea for poor gunnery? Drill! Drill! Drill! It is believed that if one quarter of the time placed upon intensive drill were devoted by the officers, who are the planners and thinkers, to a study of other ship's gunnery performances; to the acquisition of knowledge on the proving methods and the statistics on guns at the proving grounds; to the data on the accuracy and probability of gunfire; and to a thorough, conscientious, painstaking analysis of each and every report of target practice of their particular ships, our naval gunnery would jump by leaps and bounds.

If you would look further for proof of the value of these reports and the feasibility of their use in preparing for target

practice and battle, attention is called to the recent short range director practice of a vessel of the Atlantic fleet, the methods of preparation, and the execution. For years it had been assumed on this vessel that the guns of the main battery had different ballistics; at least different corrections had been used for the separate turrets on previous practices. A careful study of the reports of practices revealed the error of this assumption; in other words the idea of excessive dispersion between guns or between turrets could about ninety per cent of the time be attributed to the functioning of the personnel in the operation of the material. The errors which had been made over a period of eight years were compiled and summarized and there was presented an imposing array of glaring mistakes committed right on board the vessel; not by the ammunition depot, the powder manufactory, the designer of projectiles, or the proving ground experts.

What better way to convince a spotter that it is practically useless to spot shots in range and deflection in short range battle practice and in deflection in short range director practice than by presenting him with figures which prove that during the previous seven or eight years fifty per cent of the spots given on one particular vessel were reversed on immediately succeeding shots or salvos and that an additional twenty-five per cent were not necessary as spots at all?

The best way of convincing a set of pointers of the importance of pointing at the center of the bull's-eye is to summarize the misses over a given period, coupled with a comprehensive explanation of the value of hits in the computation of ship and gun scores.

Plotting—praises be! If ships would only break forth their antiquated records and analyze them for the purpose of learning how rangefinder ranges and ballistic corrections checked on each shot or salvo with sight bar ranges and hitting gun ranges the results would be surprising, if not astonishing. How some ships can fire a poor practice and the plotting room get a clean slate is a mystery—no, not a mystery but rather a humorous paradox. There was once a fleet gunnery officer who appreciated the fact that too little attention was being paid to the repetition of errors in the plotting room; and so he often made it a point

to observe the target practices of the different vessels coming under his cognizance—in the plotting room. The incorrect setting of convergence systems has been a very noticeable cause of misses in director fire during previous practices. A careful computation of the proper convergence for turrets checked with the settings of the system as recorded on former reports and this checked with the observations of the fall of shot on the same reports furnish ample data for the conclusion that these convergence systems are too often improperly handled.

Suppose there is a question whether it is more desirable in director practices, especially those at short range, to fire on the up, or down roll, or both. An examination of the reports with their data on roll and pitch checked against the time of salvos must furnish some information as to the augmenting or retarding of the roll by one method or the other. Such an examination for the ship in question revealed the fact that firing on the up-roll on previous firings had given the vessel a decided kick on each salvo. The up-roll was chosen and the results attained in the next practice bore out this decision quite conclusively.

Probably the most important revelation made in a careful study of these reports of former gunnery exercises was the fact that if the computed ballistics had been used with more confidence and if spotting had been cut down about seventy-five per cent the vessel's hitting power and gunnery score would have increased remarkably. Excessive spotting has had the tendency to alter ballistics for different turrets when they are firing separately with consequent misses on opening salvos of succeeding turrets. In other words the spots necessary to correct the errors of one set, whether pointer or director fire, were carried through as ballistics to be applied to the following set—a practice which it is contended is incorrect. The erratic shooting sometimes resulting from this procedure has led to the assumption that turrets and guns shoot quite differently, that computing a ballistic for all guns of a battery of the same caliber with the idea of its being found correct for all guns is a useless waste of time and energy, and that it's all a matter of luck anyway. It is probably this very point of view that has made short range director fire a matter of luck. A real, painstaking analysis of the reports of previous target practices, fallacious and incomplete

as they sometimes are, would have established, not beyond a reasonable doubt, but would have suggested entirely different conclusions. The records are not faultless because they are not taken with perfect care, by perfect men, with a perfect idea of what they are for; but they are tremendously valuable. They at least form a working basis for the formulation of a policy, a plan. It requires a person with keen judgment and a sense of proportion to weigh the rather incomplete evidence propounded in the pages of target practice reports but there are always to be found certain luminous facts which stand out like the headlines of a yellow journal.

It must be sincerely hoped by those who appreciate the intrinsic value of records and are in accord with the principles upon which our present system of compiling and analyzing them are founded that no influence will be brought to bear to eliminate them. If the paper-work must be moderated, so be it, though it is hard to see how it is possible to obtain valuable data from any curtailment of the present system, with the possible exception of doing away with one or two superfluous sheets here and there.

If one is to concede the correctness of the views expressed in this brief treatise it is rather to be hoped that means will be taken to further instruct parties of observers in being more careful and detailed in obtaining their data. Efforts will be made to explain the importance of the link which individual observers' reports form in the chain—a chain which measures the progress while ever leading towards the real desideratum: maximum volume of effective fire at every instant when within gun range of an enemy.

In conclusion why is there not disseminated from the department or from the fleet, force or division staffs if they are truly interested in an improvement of our naval gunnery, which must at the present time be a cause of reflection in at least one fleet, why do they not publish pamphlets analyzing the faults set forth in practices, comparing results, giving forth praise or criticism where due? Ships would like to know what is considered to be a fair day's shooting under different conditions. A little advertising; a little cost finding; a little salesmanship; a little accounting.

We are not using the records we have on board and in addition the only time we hear what the other vessels are doing is when we observe them or at the end of the year when the scores are pub-

lished—"and there is no health in us." Let's have the news. During the war the division with the grand fleet was a veritable circulating library of information which fact rather discounts the idea that they didn't do any of that sort of thing "on the other side," but what has happened to a system of propaganda that was once so useful in achieving results? Aren't we really trying to design a machine by the light of a Christmas candle when a mere turn of the snap switch close by would present a flood of brilliancy from the Mazda lamp overhead?



## DISCUSSION

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### Psychology and the Naval Officer

(SEE PAGE 1909, WHOLE No. 226)

LIEUTENANT D. P. MOON, U. S. NAVY.—Lieutenant F. H. Gilmer in his article, named above, states that "All mankind, except imbeciles, are capable of being properly designated as belonging to one of three classes." These classes he defines as the "thinker," the "director," and the "doer." He then proposes to divide all naval officers into these three groups and assign them to duty according to the group into which they fall by psychological test.

This plan might be all right if officers were all nicely tagged with the proper classification and were just waiting for a psychologist to come along and decipher the tag so that they and the Navy Department would know just what kind of work they should do the rest of their lives. But they do not come so nicely tagged.

Lieut. Gilmer is giving the multiple type theory when he divides mankind into groups. This doctrine is expounded for the most part by fireside scientists who never go to the trouble to test their fine theories by actual experimental verification. Such theory is disclaimed by practically all psychologists who merit the name.

Views of psychologists in general are summed up by Edward L. Thorndike, Professor of Educational Psychology in Teachers' College, Columbia University, who makes the following objections to the multiple type theory; pp. 379 to 381, volume III of "Educational Psychology":

"In proportion as exact measurements have been applied, evidence expected to favor the multiple type theory has turned out in favor of the single type theory."

A second objection is "the rarity of the inverse correlations between desirable traits upon which so many of the supposed multiple types are based."

Another objection is that "investigators who are strongly in favor of the multiple type theory and accustomed to interpret facts in harmony with it, yet find so few cases of it."

"Lastly," he states, "I may mention the fact that satisfactory proof of the existence of a distribution of human individuals after the fashion demanded by the multiple type theory has never been given in a single instance, and the evidence offered by even the most scientific of the theory's adherents is such as they would certainly themselves consider very weak if they were not already certain that types of some sort there must be. Thus a fair minded perusal of Stern's "Psychologie der Individuellen

Differenzen," designed to be a description of the types into which human nature falls, is almost a sure means of stimulating a shrewd student to the suspicion that intermediate conditions are more frequent than the supposed types, and that there are far more ordinary people than there are of all the 'types' put together."

Lieut. Gilmer laments that "with the exception of a few specialists, (all officers) are doing general duty." The Navy Department in setting such a policy has not done so blindly. Sad disillusionments have occurred in the past when too much specialization has been tried and there are many officers who think that we have too much at present. A wide variation in an officer's duties is imperative to give him the experience and necessary general education for the exercise of command rank.

If the plans of the article were followed, each newly graduated ensign would receive a psychological examination to determine if he was "properly equipped to be qualified as office material" and to "show to which of the classes the officer belonged and the results should be used as a guide in the assignment of that officer to certain specific duties." A midshipman is under constant test of his officer-like qualities during four long years. No psychological test that could be devised could test him as he is tested during this time. Thorndike shows that no classification could be made such as Lieut. Gilmer wishes to make. Even if it could be, any ensign assigned for life in one of the classes as the result of a test would suffer a grave injustice. There would be no certainty that he could not do just as well in one of the other classes with a little training, yet he would be forever barred from finding out, and his general education would be greatly limited.

A tacit assumption made is that officers have no choice in the selection of their duties. This has but little foundation except in the case of junior officers who are often shifted from one duty to another without much reference to their desires, but only as wise steps in their education. As an officer's length of service increases he has increasingly greater choice in the selection of the duty he performs. If an officer does poorly in any particular line of work, it will be naturally distasteful and he will select some work which is more congenial. Psychological experiments have shown that when people are engaged in work which they like, there is a high percentage of cases in which the people can do the particular work each is engaged in most efficiently. The net result is that most officers get the work which they can do best.

Granting for a moment that there are three classes as stated, it is difficult to recognize in the "doer" the qualities that would make an officer. "The doer is the man who when properly directed will exert much energy in the performance of his duties.—The doer is an able subordinate though seldom capable of assuming the duties of high command." This definition would perhaps fit the lower grades of petty officers but has small application to officers.

The application of psychological principles may help solve many problems in the Navy. Personally I have found a psychological test devised by Lieut. (C. C.) R. S. Hitchcock very useful in picking out fire control personnel. There are many other uses to which the principles may be put, and though Lieut. Gilmer's article does good in creating discussion, it misses the mark.

### The General Board

(SEE WHOLE NO. 228, PAGE 189.)

REAR ADMIRAL BRADLEY A. FISKE, U. S. N. (Retired).—My much admired friend, Admiral Wainwright, does an unintentional injustice, it seems to me, to suggestors of new schemes. I allude mainly to the sentences:

Admiral Fiske, writing on the defense of the Philippines, states that he had recommended that reliance for their defense be placed on airplanes. This was made at a time when the efficiency of the plane, even as a scout, was all to be developed in the future. One is reminded of Admiral Sir Percy Scott, the great prophet of the submarines. Both admirals have rendered important services to their respective countries; both have large imaginations and are gifted with a prophetic *flair*, but their advice for present everyday work has not always been the best. Prophecies of the future are not always the best foundation for the present needs. Had this character of advice been followed, our destroyers would have been without torpedoes while the ten thousand yard torpedo was being developed, and the shore of the Philippine Islands littered with the wrecks of imperfect airplanes. To prophesy for the future the head may be in the clouds, but to provide for the present, the feet must be firm on the ground.

This paragraph indicates the estimate of the inventor of new schemes that used to be held, but that is held by only a few at the present day. Most people realize now that it is possible to propose a new scheme and yet keep one's feet on the ground. Most people also have learned from the progress of the last half century that the mere fact that a certain apparatus is unreliable is no reason for refusing to try to develop it and make it reliable.

As a matter of fact, I did not "recommend that reliance for their defense (the Philippines) be placed on airplanes." I simply suggested that a certain scheme be tried, to redeem a situation that was admitted to be hopeless.

At the time (1910-1911) I had been inventing for thirty years, had made a few successes and more failures (as every inventor does), and knew from bitter experience what a wide chasm separates an attractive idea from an actually produced invention. I knew that airplanes, at that time, were wholly undeveloped and wholly unreliable; but I felt absolutely sure that *they could be developed* in instruments of war that could prevent any troops from landing in open boats. Events have proved that I was right. I merely suggested a line to work in. Subsequent events have proved that it was a good line: perhaps the only good line.

Of course, Admiral Wainwright is correct in believing that there is danger in pursuing new schemes and neglecting schemes that have been tried and proved to be good. But every navy officer knows that; even if he invents new schemes. Like every sensible manufacturer, no matter how enterprising he may be in developing new apparatus, *he must be very careful to make experimental work take a place subordinate to regular work.* Like every good sailor, he must not let go of one rope until he has got hold of another.

I am sorry that Admiral Wainwright thinks that the change from the Aid System to the present one was a "step backward." As Aid for Operations, I found when the Great War broke out in Europe, that I was wholly powerless to do anything except routine work: largely for the reason that the office was not legalized, and could be abolished at any moment by the Secretary. The Aid for Operations, and the whole Aid System, could not continue to exist save by his consent.

So I concocted a few paragraphs which Hobson got put into the Appropriation Bill in January, 1915, by the unanimous vote of the House Naval Committee. This provision created the office of Chief of Naval Operations; an office which no Secretary could abolish. Secretary Daniels succeeded in striking out some of the most important clauses; but I got some of them put back the following year, notably the clause directing the detailing of "at least fifteen officers" for making war plans.

The Aid System was an admirable step toward a General staff. But it was a short step, and it constituted a wholly inadequate organization for war or preparation for war. I think it is the consensus of officers who have had experience with both organizations that the office of Chief of Naval Operations is better than the Aid System.

### Officers for Shore Duty Only

(SEE PAGE 1885, WHOLE NO. 226)

CAPTAIN E. P. JESSOP, U. S. NAVY.—The comment offered by Captain Snow (CC.) in the February number of the PROCEEDINGS seems to the writer to be based on a very cursory reading of the original paper on the above subject, or else the writer's methods of expressing his thoughts are confusing. Whichever reason is true, it would seem to be necessary to attempt to clarify some points at issue since it is believed that the subject is very vital to naval efficiency and should have a complete airing.

In the first place, I would ask the discussionist to reread the article with the following points in mind:

That the writer believes, and bases his article on his belief, that no specialist can be as efficient in his specialty without practical experience in the operation of the product of his specialty as he will if he has that experience.

That the corps system, both in construction, and engineering in the Navy, acts to prevent that experience being gained by the members of the "officers for shore duty only" class.

That it is perfectly feasible for that class to get the proper proportion of practical experience without in any way reducing their ability in design and construction, but on the contrary greatly enhancing it.

That the members of the Construction Corps and of the "engineers for shore duty only" class, are losing incentives and perquisites by not being available for command and the former are losing something in promotion which must always make for a soreness in their souls for which there is only one remedy and that is putting them all in the regular line and making them as much a part of the operative as of the industrial Navy.

That the ability of the personnel of both the Construction Corps and the incipient Engineers Corps is unquestioned, but that the limitations imposed upon them by the corps system, and particularly in the training of the younger generation under that system, narrow their viewpoint and limit their usefulness to the Navy unnecessarily, and most seriously.

That it is not economical for the Navy to spend large sums of money educating specialists and then to curtail their usefulness to the service as the corps system does.

That the amalgamation of the engineers, while effected primarily to put a stop to friction between corps on board ship, resulted in great improvement in engineering in every way, and it was not until 1916 when the "engineers for shore duty only" law was foisted on the service with its gradual removal to the beach of the older officers who had trained themselves in engineering and liked it, that engineering in the Navy began to run down again.

That the corps system both in the Army and in the Navy has been an obstructive element always, and for our purposes as far as construction and engineering are concerned it is particularly deleterious because of the intimate relation of personnel and material in a ship if she is to be an efficient unit of the fleet.

In other words, the writer thinks that Mr. Squeers was right when he said, "W-i-n-win-d-e-r-der, go wash it," as it takes such intimate connection with a window to find out if the putty is standing up to its work, if the sash fits in its grooves and if the other adjuncts for the operation of the window are right.

The discussionist does put his finger on a weak point in the original article when he points out that no chief of Bureau of Ordnance has served in that capacity for twelve years. The writer had in mind the chief of Ordnance of the Army, and temporarily confused the two, but the essence of the statements made in that connection are true and are known to all who were intimately associated with ordnance at sea immediately after the Spanish War.

His discussion of the relation between length and stream lines seems a bit beside the point.

The idea expressed by the writer was that continuous practical demonstration at sea of the difficulties of making the hulls as designed do what they were designed to do should have acted on any Navy constructor present to cause him to be more interested in cures for the condition than he could have been without such practical demonstration.

In practice, it was almost impossible to drive those ships at their designed speeds for any extended interval due to the fact that to do so called for the maximum overload which could be placed on the machinery, and if they could not be driven at such speeds for extended intervals, then they were not the effective units of the fleet that they were designed to be, and, therefore, the design was wrong. If, as intimated by the discussionist, the design was made on the economical speed factor, letting the battle speed take care of itself, then we simply have another argument for amalgamation.

I believe it to be quite clear to the Navy in general what battleships were of bad design for getting battle speeds with a practical horse-power, but for the information of the writer of the discussion I will state that no ship prior to the first dreadnaught showed proper results in this regard.

This subject cannot be quitted without inviting attention to the fact that the model tank experiments are practical, not theoretical, experiments and they are also operative experiments, and by the statement of the discussionist I take it they have been successful in pointing the way to improvement in the lines of ships, and it does not therefore seem improbable that the writer's idea that further practical experience with the operation of ships would enable the constructors to clear away other weaknesses of our ships if the constructors were given the opportunity for such experience.

The statement that "American destroyers, some years ago, were making their speeds with about two-thirds the power of contemporary British destroyers of equivalent size and speed," seems to be true of our later type of boats, while not so true of the classes of ten and twelve years ago, but even the horse-powers of the late boats which were, evidently, used by the discussionist are the designed horse-powers and it would be very interesting to know the actual performance data on these vessels.

By far the most serious misapprehension which the discussionist labors under is shown when he states apropos of the extra horse-power needed to drive British destroyers: "This, however, does not show that the British constructors were in error in adopting what the author would, undoubtedly, call inefficient stream lines. At that time the British engineers were developing a horse-power on much less weight than we were. Getting their horse-power so cheaply, as regards weight, it was justifiable to adopt decidedly shorter boats, with the attendant advantages, and to accept for top speed the high resistance necessarily incident to reduced length."

The value of a destroyer in war time rests so much on her fuel consumption, a great part of which must be expended at high speeds, that it is past all comprehension how any sane individual could seriously make the statement quoted above.

One-third less horse-power means one-third less fuel burned and one-third more radius of action with equal bunkers, and yet according to our critic, "this does not show that the British constructors were in error in adopting the shorter boat." The above but demonstrates the false viewpoint of a practical problem incident to separation from practice caused by the corps system.

One almost wonders if the discussionist ever saw one of our earlier battleships underway at sea when one reads his statement. "The mere fact that at maximum speed and over a range of only a knot or so, a battleship makes a strong bow wave does not necessarily justify the conclusion that the specialist did not know what he was doing and would have prepared a different design if he had had a three-years' cruise on another ship."

The "strong bow wave" extended over many more knots than indicated above.

The writer can assure the discussionist that the material from which he wrote the original article is authentic and is well known to the greater part of the Naval service, and specific incidents are not used simply because it was the desire of the writer to omit personalities entirely and to deal with systems and results.

The present condition in engineering while greatly superior to that existing at the close of the Spanish War is believed by the writer to be below what it would have been if it were not for the evils of the "engineers for shore duty only" law, and it was to attempt to correct while there is yet time, a serious lowering of our engineering standards, that the article in question was written.

To conclude, attention is invited to the discussionist's statement that: "Amalgamation of the Construction Corps with the Line will violate a fundamental principle of organization as it means the complete coalescence of two corps whose lines of training, thought and life-work are radically different, although they strive toward a common end—the defense of the nation."

It thinks the violation of the fundamental of organization consists in permitting two corps, having such a vital effect on the efficiency of a unit of the fleet to be so radically differently trained, as to cause them to have a widely different viewpoint and thought, and it was to correct what the writer considered a violation of fundamentals that amalgamation was proposed.

As for criticism; those at sea will always criticise those on shore and to make this criticism effective it is necessary that both sides know the other fellows' work and viewpoint.





## U. S. NAVAL INSTITUTE

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Lieutenant Commander A. H. Dutton, U. S. N. R. F.  
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C. Nygaard, Ch. Bosn.

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# PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT R. A. HALL, U. S. Navy

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## FRANCE

FRENCH NAVY YARDS.—If the provisions made under the Guist'hau program are adhered to, the Brest and Lorient arsenals will specialize in cruisers and destroyer construction—Cherbourg will be entrusted with submarines, and Toulon will have quite enough with attending to fleet repairs. This arrangement will have the advantage of keeping some 24,000 arsenal workmen in nominal employment, but it is likely to mean slow work, as State arsenals have lost much of their efficiency through the war, and have only been able to repair half of the ex-Boche cruisers and torpedo craft allotted to the French Navy in 1919, with the result that the 8,000-ton cruisers, shortly to be laid down, may require four or five years before they are commissioned, which means that they will be outclassed when entering the service. There can be no true efficiency without quick construction; and here, unhappily, its inefficient arsenals are like a millstone round the neck of the Marine Française; and the worst is that there is little chance of remedy without stability and authority at the head.—*Naval and Military Record*, 15 February, 1922.

STRENGTH OF MEDITERRANEAN SQUADRON.—As from February 1 the French Mediterranean Squadron will be as follows: Battleships *Bretagne* (flying the flag of Vice-Admiral Salaun, the commander-in-chief), *France*, *Paris*, and *Jean-Bart*; two squadrons of destroyers, a squadron of submarines, and patrol vessels.

The personnel will be reduced by one-fifth of its present strength. The battleships *Provence* and *Lorraine* will be put into the reserve.—*Naval and Military Record*, 28 January, 1922.

**NEW HYDROPLANES.**—In the first week of December, Messrs. Thornycroft despatched from the Thames a new motor torpedo-boat, of the skimming or hydroplane type, for the French Navy. On trial the vessel attained a speed of 41.6 knots, or 47.9 miles an hour. The new vessel is practically of the coastal motor-boat class which during the war achieved such good results at Kronstadt, Zeebrügge, and elsewhere. Their design was developed in 1915 by Messrs. Thornycroft, largely as a result of experiments Sir John Thornycroft had begun nearly forty years previously. The construction of the first dozen of them was decided on by the admiralty early in 1916, and, in all, well over 100 were built by Messrs. Thornycroft and their licensees. The present vessel, which is the second ordered by the French Government—the other and rather smaller one having already been delivered—is 55 feet long, with a beam of 11 feet and a draught of 3 feet 3 inches. At first sight she does not look very impressive, but, thanks to her special construction, she can face heavy weather, and she carries the formidable armament of two 18-inch torpedoes, two depth charges, and four machine guns. For the sake of lightness and flexibility, she is built entirely of wood. There are two skins, both of Honduras mahogany, with a layer of oiled canvas interposed between them. The deck extends over the greater part of the length of the vessel, and constitutes an integral part of the structure. A third skin, worked in from the fore portion of the boat, and extending to amidships, forms a step about  $3\frac{1}{2}$  inches in depth, upon which the vessel rises as she gathers speed, and thus she obtains a skimming action over the surface of the water.—*Journal of the Royal Service Institution*, February, 1922.

**DIRIGIBLES.**—The French Government is maintaining a very reserved attitude over the question of airship construction. Before doing anything further it is awaiting developments and acquiring fresh experience which is believed to be necessary in view of the uncovincing results obtained with the dirigibles previously constructed in this country, and especially with the three German airships which were surrendered under the terms of the Versailles Treaty. The *Dixmude* was taken over by the Marine and was intended to be used for survey work over the Mediterranean and North Africa, but for some time past the German airship has been lying in its shed near Toulon waiting for repairs which the authorities are reluctant to carry out. As the *Dixmude* is already four years old, which is regarded as the normal life of an airship, it is feared that repairs will be continually absorbing large sums of money. The *L-133* has had to be taken down at Maubeuge before it could render any useful service, and the *Nordstern*, or *Méditerranée* as it is now called, is still waiting in its shed at St. Cyr until arrangements can be made for handing it over either to the military or naval services. It is feared that the *Méditerranée* will share the fate of the other airships. Dirigible balloons have not lost favor for military purposes. The authorities are merely of the opinion that it is prudent to await the results of technical investigations in this country, and of the progress being carried out elsewhere, before embarking upon the construction of new airships.—*The Engineer*, 27 January, 1922.

**COAL-BURNING SHIPS BECOMING MORE POPULAR IN FRANCE.**—According to information emanating from French shipbuilding centers, it appears that coal is again coming into favor, while oil-burning vessels

are becoming less popular. Although it is true that in recent times French shipbuilders arranged for oil consumption in their new vessels, coal furnaces, it is stated, are now being installed in greater numbers, due to the fact that while oil is holding its price fairly well, bunker coal has become comparatively cheap.

Until 1914 coal was almost exclusively employed for French vessels, the exceptions occurring in the case of warships and certain transatlantic liners where speed was more important than economical operation. Immediately after the armistice, however, owing to the pitiable state of the French coal mines, demoralized labor conditions and the high cost of coal, French shipowners and shipbuilders turned to oil. During the last few months, however, the price of coal having fallen 40 per cent and that of oil only 20 per cent in European ports, coal has again come into favor.

Although the advantage of oil fuel is admitted, and the lower cost and greater expedition of bunkering is recognized, there are many arguments in favor of relinquishing the use of oil-burning ships. At present, moreover, oil depots on the European coasts are too few and far between, with the result that many a cargo steamer which employs this fuel finds itself occasionally obliged to make a detour to reach a depot before supplies run out completely and thereby causing a loss for its owner which the use of coal would have prevented.—*Nautical Gazette*, 25 February, 1922.

**MARSEILLES' GREAT CANAL.**—While Marseilles claims to possess more extensive and modern harbor facilities than any other port on the Mediterranean Sea, the establishment of auxiliary subports northwestward along the coast has been found desirable and is being pushed, says Consul Wesley Frost.

From eight to fifteen miles northwest of Marseilles and separated from it by a high rocky ridge, is a series of lakes and inlets adaptable for port development. Accordingly, a huge ship canal is being driven through the promontory to connect Marseilles with these inlets and their present small ports of Martigues, Port-de-Bouc, and Caronte. The canal is also being extended farther westward to the mouth of the Rhone to connect with the lateral canal running down the Rhone from the north.

As an engineering task this canal surpasses any project undertaken in any part of the world since the construction of the Panama Canal. It involves the construction of a continuous four-mile tunnel through the ridge, with a cross section six or seven times as great as that of any existing railway tunnel. On emerging from the subterranean passage, the canal flows in the open channel of Gignac, 2 kilometers in length, with a depth of 30 meters. It then follows the south bank of the lake of Bolmon and of the lake of Berre as far as Martigues.

There it joins the canals already in existence between Martigues and Port-de-Bouc, and from Port-de-Bouc to Arles, joining the Rhone at the latter point by a lock 160 meters in length and 16 meters in width. Throughout its entire course of 81 kilometers, the canal is on sea level.

The depth of the canal between Marseilles and Port-de-Bouc is 4 meters (13 feet), and between Port-de-Bouc and Arles 2.5 meters (8 feet). In those sections where there is a current the canal has a width of 25 meters at 2 meters below the surface of the water. In the Rove tunnel the width is reduced to 18 meters; but this will allow the passage in continual movement in both directions of two sea barges of 3.75 meters draft, able to carry 1,200 metric tons of cargo.—*Nautical Gazette*, 25 February, 1922.

## GERMANY

GERMANY AND AVIATION.—The recent announcement by the Council of Ambassadors that the treaty restrictions on the manufacture of German aircraft are to be lifted on May 5, is one of the most important events of the present period of the development of aviation. Germany has occupied a peculiar position in the development of aircraft ever since 1914. In the construction of lighter-than-aircraft she has excelled the efforts of the rest of the world. This is because she has always placed great confidence in them while the other nations have been somewhat doubtful as to their utility.

In the heavier-than-air field, German designers have been laboring under various restrictions ever since the naval blockade went into effect during the war. The lack of materials forced them to develop many ingenious expedients, while at the same time many valuable lines of investigation were absolutely closed to them. After the war the Allied aircraft prohibition that has been in effect until Germany complied with her treaty obligations, virtually stopped any new construction to date.

The terms of the Versailles Treaty prohibit Germany from having any military aircraft and very greatly limit her sea fleet. The enormous tonnage of merchant marine that she has been required to turn over in payment for the Allied and neutral ships wantonly destroyed during the war, has inclined many influential Germans to the view that she will have to take to the air if she is to regain her lost commercial prestige. The combination of these factors has resulted in the production of some remarkable commercial aircraft designs.

There can be no doubt that the various German aircraft manufacturers will attempt to sell airplanes abroad. There are many who feel that the Americas, and in particular the United States are the most promising fields for exploitation. In this country foreign airplanes are subject to a high tariff and are required to pay for patent licenses. It is a serious problem and one worthy of very earnest consideration by all interested in the American industry, whether or not the low operating cost of the German designs will not far outweigh their high first cost, particularly in view of the rate of exchange and the cost of foreign labor. It is certain that from the operating cost standpoint, war surplus machines will be hopelessly outclassed in regard to their use as *transport* machines.

The more general aspects of the revival of competition are also to be debated. There are many people who feel that the removal of the restrictions constitute a menace to civilization on the ground that the machines to be constructed will constitute a potential air force as the manufacturing facilities can be readily diverted to war use. It is an old adage that states that competition is the life of business. There can be no doubt that German competition will greatly stimulate manufacturers both here and abroad toward new developments.—*Aviation*, 20 February, 1922.

NORTH GERMAN LLOYD RESUMES TRANSATLANTIC SERVICE.—After a lapse of more than seven years the North German Lloyd has resumed its passenger and freight service between Germany and the United States, and three vessels have been placed on the run between New York and Bremen. These are the *Seydlitz*, *Hannover*, and *Yorck*, each of about 9,000 tons, which have been reconditioned and fitted to carry 200 cabin and 1,000 third-class passengers. The service will be inaugurated by the *Seydlitz* which leaves Bremen on February 11, arriving at New York on February 23 and departing on the return trip on March 1. Thereafter a fortnightly service will be maintained. The company has opened its New York headquarters at 18 Pearl Street, and its steamers will



load and discharge at the North German Lloyd Pier at the foot of Sixth Street, Hoboken,—*Nautical Gazette*, 4 February, 1922.

**GERMAN SHIPBUILDING AND SHIPPING.**—The report of the Hamburg Chamber of Commerce for 1921 refers to the agreement concerning State compensation to the shipping concerns, according to which an aggregate compensation of 1,200,000,000 marks was settled in February. The distribution of this sum was left in the hands of a body of representatives of shipyards and shipowners, under the name of the Shipbuilding Bank, Hamburg.

An efficient distribution of this sum was impeded by alterations in the German home prices and by the adverse necessity of spending 90 per cent of the amount on orders to German shipyards. This prevented German shipowners from contemplating the possibility of buying back on a somewhat large scale former German vessels. The assumption that one third of the former German tonnage could be rebuilt by the aid of the compensation fund would appear, under the circumstances, to be an extremely problematical one. Wages and the prices for shipbuilding steel are now considerably higher than in February, 1921. The plan of the buying bureau for ship steel, according to which material would be delivered in future to the German shipyards only on the basis of foreign exchanges, appears to be simply prohibitive and liable to frustrate the solution of the unemployment problem, an end which was also in view when the compensation agreement was entered into.

German shipping particularly regrets that it is handicapped in many countries; thus German boats are excluded from coasting traffic in Sweden; Italy, also, has deprived Germany of shipping. In the United States the alien tonnage tax has to be paid. Britain supports her own passenger traffic. The Dardanelles are still closed to the German flag, nor are German vessels allowed to enter any ports in Morocco. We may here add that all these measures are most mild compared with those which Germany would probably have taken had she won the war.

Germany, however, is endeavoring to extend her shipping in various ways, and in Holland, amongst other countries. This refers more especially to the Royal Dutch Lloyd, but this scheme is said to have of late experienced financial difficulties. The first German bid is understood to have been declined as inadequate; negotiations are, however, being proceeded with. Germany tried once before to obtain the control of this Dutch company, namely, in 1906, when the Hamburg-America Line and the North German Lloyd made a bid for 60 per cent of the share capital of the Holland-South America Line, which was then in difficulties and was transformed into the Royal Dutch Lloyd. A Dutch concern made the same bid as Germany and carried the day.

The Howaldt yard in Kiel, which pays 24 per cent dividend for the last financial year, as against 20 per cent for the previous twelve months, is well supplied with orders for the current year; these orders will also keep the yard partly employed for the year following. This in spite of the yard having been deprived of a number of contracts for new vessels on account of the State not having been able fully to carry out its promises of help towards the reconstruction of the German merchant navy. The repair of vessels, especially foreign ones, has materially contributed to the satisfactory result. The company's share in the Holstein iron works at Rendsburg is said to have been sold to the Rombach iron works on favorable terms.

The Deutsche Werke Company, the former Imperial yard at Kiel, and the works at Spandau, in which the German State is interested to

the extent of 100,000,000 marks of ordinary shares and 330,000,000 marks of "certificates," which participate in a dividend above 5 per cent has, rather late in the day, issued its report for the period June 17 to December 31, 1920. Of the profits, amounting to 171,400,000 marks, general expenses absorbed 57,800,000 marks and reserves and writings-off 113,100,000 marks. Both at Kiel and Spandau a number of workmen had to be discharged in the course of the period under review. The fact that the company had to find employment for a larger percentage of badly disabled men than other concerns is said to have had a detrimental effect upon the financial results.—*Engineering*, 17 February, 1922.

KIEL CANAL TRAFFIC.—In 1921, 31,910 vessels of 9,506,466 net register tons passed through the Kiel Canal. Of these, 19,206 were steamers of 8,093,663 tons.

The nationalities of these vessels were as follows:

	Vessels
German.....	25,349
Swedish.....	1,509
Dutch.....	1,026
Norwegian.....	767
British.....	663
Finnish.....	295
American.....	227
Danish.....	155
Danziger.....	143
French.....	129
Russian.....	95
Belgium.....	39
Japanese.....	14
Others.....	1197
	<hr/> 31,910

No less than 15,381 vessels of 4,429,987 passed through the canal going east, and 16,529 vessels of 5,076,479 tons passed through in the opposite direction.—*Nautical Gazette*, 15 February, 1922.

#### GREAT BRITAIN

THE NAVY ESTIMATES.—More than ordinary interest will attach to the navy estimates for the forthcoming financial year. They will doubtless reflect in some measure the decisions of the Washington Conference, though not, perhaps, to such an extent as some people suppose. The vote for new construction will probably be diminished by the cancellation of the four battle-cruisers, but, if the Government decide to push on with the two-battleship program without delay, this vote will still remain at a fairly high figure. From a recent statement by the Prime Minister it seems that a decision in regard to the two ships has not yet been reached, and that the matter will remain open until Mr. Balfour has made a full report of the Washington transactions to the Cabinet. It is no secret, however, that strong pressure is being brought to bear on the Admiralty with a view to securing their consent to a further postponement of capital ship construction. The Sea Lords will have to fight hard for their two ships, which are absolutely essential if the British Navy is to maintain its relative standing.

Another danger to the Navy is the Geddes axe, which is seen to be hovering menacingly over the personnel; but we do not believe that the public, despite its anxiety to see expenditure curtailed, would approve any measure which threatened to destroy naval efficiency. Irrespective of the Geddes recommendations, the navy estimates will probably show a fall of twenty millions, as compared with those of last year, in which case they will approximate to £60,000,000. In view of the immense increase in the cost of everything required by the service,

this sum is equivalent to little more than thirty millions on the pre-war scale of value. It is altogether misleading to compare naval expenditure before and after the war without making due allowance for the depreciation in the purchasing power of money.—*Naval and Military Record*, 15 February, 1922.

**NAVAL PROBLEMS TO BE SOLVED.**—The prolonged era of peace which preceded Armageddon had not undermined the cardinal tradition of the British Navy, to seek out the enemy and destroy him, but it may be doubted whether sufficient attention had been paid to the methods of search. The veriest tyro in naval matters must have foreseen that, in view of British preponderance in strength, an Anglo-German war at sea would largely resolve itself into a game of hide-and-seek, and that the enemy would employ his forces, especially those in foreign waters, to create diversions with the object of compelling us to detach ships from the main body, thereby reducing our margin of superiority in the main arena. As all this must have been clearly appreciated by those responsible for the war training of the Navy, it is the more surprising that so little was done to prepare for contingencies so patent to every discerning eye.

It is impossible to read Sir Julian Corbett's narrative of the *Goeben* affair without a feeling that events would have taken a very different course had the problem of locating and intercepting an enemy force been studied more closely beforehand. The quarry in this case was known to be in a certain well-defined area, with a very limited choice of exits, and our available force was not inadequate for the work in hand; yet the result was complete failure. In other zones the task of hunting down isolated enemy cruisers involved the employment of a great many ships—sometimes the ratio was as high as ten to one—whose withdrawal gravely handicapped operations elsewhere, and more than once led to a serious reverse. If, therefore, the teachings of the war have been taken to heart, such future maneuvers as a depleted purse may render possible will not be confined to the realm of grand strategy, but will no doubt extend to the elucidation of such problems as we have indicated above, and which have invariably cropped up in every naval campaign in which we have been engaged.—*Naval and Military Record*, 8 February, 1922.

**NAVAL ECONOMY.**—In any consideration of the Geddes report so far as the Navy is concerned, it is recognized fully that the interests of the country require that economy in public expenditure shall be exercised to the utmost limit, and that a reduction of the Naval Service is inevitable. It is, moreover, possible to acquiesce in such a reduction because there are no probable enemies in view. The expenditure on the Navy is an insurance for our very existence, but since the risks against which we insure are less, the premium can—for the present—be safely reduced. The question at issue is rather as to how the cuts are to be made. Here it must be pointed out that the Admiralty indicated their policy no less than two years ago, in the first Memorandum by the Board after the armistice. "Since sea power is essential for the security and prosperity of the British Empire," said this Memorandum, "it is the object of the Board of Admiralty to proceed on lines which they believe will provide us with our vital requirements, and at the same time secure the exercise of rigid economy." How has this object been carried out?

In regard to material, the reductions effected are well known, and an excellent indication of them was afforded by the fact that of the nineteen capital ships which Mr. Hughes proposed at Washington to scrap, eleven had already been placed on the disposal or non-effective lists before he spoke. A much more intricate and difficult problem has been the re-

duction of the personnel, but this has been carried out gradually and without violent interruption to the work and progress of the Service, until the total is now down to about 120,000. In view of the Washington agreements, this is expected to come down to about 100,000, or 51,000 less than the number provided for in the last estimates before the war. More recently the Board have been engaged in what may be termed the third stage of their economies, one which follows naturally upon the discharge of the surplus personnel and the provision of a nucleus of young seamen for post-war needs—the concentration of the work of the training establishments. Chatham and Devonport are to lose their signal training schools, it is understood, the work being centralized at Portsmouth. In the same direction, too, is the substitution of the light cruiser *Yarmouth* for the armored cruiser *Antrim*, as signal and wireless experimental ship at Portsmouth. There is nothing new in this sort of thing; it has been constantly going on ever since the armistice, and quite apart from anything suggested by the Geddes Committee.

There is a certain limit, however, beyond which, if we are to have a fleet at all—and an inadequate or untrained fleet is worse than useless—the Board cannot go. It takes many years under modern conditions, to make a sailor, and it is essential not only that there shall be a nucleus of skilled men, but that provisions shall be made for ships and establishments in which they can keep themselves efficient. We need, that is to say, a navy for training purposes, and one in which there is constant progress in the direction of experiment and research, with adequate provision for staff work and studies. It will be fatal to future efficiency if these essentials are tampered with to save more money on the estimates. If the Sea Lords have a free hand they can save even larger sums without jeopardizing the well-being of the Service as a whole. Last year, for instance, the Board decided that they had no further use for Pembroke Dockyard, but political influence frustrated the proposal to close this establishment. Similar economies in the civilian departments have been watered down because those who would be affected by them are able to organize political, trade union, or other opposition. Left to their own resources, the Admiralty have shown what they can do in the way of economical administration, and they may well say, as Lord Fisher did when he was engaged in a similar task fifteen years ago, "Don't spur a willing horse."—*Army, Navy, and Air Force Gazette*, 18 February, 1922.

**THE PACIFIC AGREEMENT.**—Another important step has been taken in connection with the preliminary work of the Washington Conference by the publication of the much-discussed Article XIX of the Naval Pact, dealing with the areas in the Pacific in which the *status quo* is to be maintained in regard to fortifications and naval bases. Only incomplete cabled summaries are to hand at the moment of writing, and in any case this section like the other parts of the proposed treaty cannot come into effect until the Powers concerned have ratified its provisions. At the same time, the measure of agreement reached between the various nations through their representatives at Washington is of special interest and importance. Although the *status quo* mainly concerns Great Britain, America and Japan, there are within the wide zone covered by it certain islands belonging to Holland and France. These islands, however, are not directly concerned, since it is very unlikely that either of the latter Powers is going to increase its fortifications out there—it would have less reason than ever to do so after the signing of such a compact as that now published.

In considering the article in its broadest aspect, it is interesting to note what are considered to be the limits of the Pacific. The neutral

zone, as it may be called, within which the Powers agree that no new fortifications or naval bases shall be established, and that no measures shall be taken to increase existing naval facilities for the repair or maintenance of naval forces, extends from 160 degrees west of Greenwich, which is about the longitude of the Hawaiian Islands, on the one side, to 100 degrees east of Greenwich, on the other. It includes Hong Kong, the Philippines, Guam, Bonin, Formosa, and the Pescadores. On the north it extends to about 60 degrees, incorporating the Aleutian and Kuriles Islands, and on the south it extends to about 30 degrees, or as far down as Norfolk Island, which is excluded from its provisions. Certain ex-German territories in the Pacific, such as Yap, were already debarred from being fortified under the terms of the mandates granted in regard to them under the Peace Treaty.

As regards the places outside the proposed zone, it would be well to await the full text before offering criticism. Cabled reports, however, show that on the American side the coasts of the United States and Canada, Alaska, and the Panama Canal zone are excluded from the agreement. So, too, are the Hawaiian Islands, where at Pearl Harbor the Americans have established a base, with a large dry-dock capable of taking ships of any dimensions. On the opposite side of the Pacific, the French settlement of Saigon and the British port of Singapore are both outside the limits of the agreement, and also the Dutch East Indies. On the south, the Commonwealth of Australia and its territories, and New Zealand, do not come within the scope of the proposal. It will be interesting to learn in due course how far the term "territories" applies, and whether, for instance, it includes the territory of Papua, previously known as British New Guinea, in the same way that it does Tasmania.

From what is known of the treaty so far, it obviously must, if carried out, prove more beneficial to Japan than to any other Power, for it removes the possibility of places in a position to be inimical to her security being fortified. The United States virtually gives up the right to construct that chain of naval bases between the homeland and the Philippines which several recent writers have shown would be necessary for the security of the latter in time of war. As Mr. H. C. Bywater said in his recent volume, *Sea Power in the Pacific*, the Philippines must be guarded by naval force or not at all, "and as the lack of a well-found fleet base near at hand puts effective naval protection out of the question for the time being, the islands would doubtless fall an easy prey to Japan in case of war with the United States." Japan, on the other hand, which is already well-nigh impregnable, as Admiral Ballard has shown, to direct attack, as a result of great natural advantages of position, combined with success in war and wisdom in diplomacy, will be rendered more secure than ever by the adoption of the new Naval Treaty, always providing, of course, that the spirit of the renewal and replacement clause is interpreted aright by the signatory Powers.—*Army, Navy, and Air Force Gazette*, 11 February, 1922.

MEDITERRANEAN EXERCISES.—The combined exercises taking place "up the Straits" this week between the Atlantic and Mediterranean fleets scarcely justify the term "maneuvers" which has been applied to them in some of the papers. For one thing, as the Admiralty have enjoined strict economy in the consumption of fuel, those periods of steaming at high speed which are essential if fleet exercises are to be conducted on a realistic scale will be impossible. A good many years have elapsed since the British Navy engaged in full-dress maneuvers, and in view of the needs for economy there is not much likelihood of their being

repeated in the near future. This is to be regretted, for many problems of strategy and tactics suggested by the war still await solution, and the only practical way of solving them is to employ the fleet in conditions approximating as nearly as possible to those of war.

Whether maneuvers after the conventional pre-war fashion, in which most of the time was taken up by movements and counter-movements on the part of "Red" and "Blue" battle fleets, afforded the best preparation for the "real thing" is a point on which service opinion is divided. While it is, of course, essential that frequent opportunity should be afforded to senior and flag officers to handle large formations at sea and master the difficult art of keeping the enemy under the maximum volume of fire throughout every intricate movement, many officers believe that more time should be allotted to the study of those subsidiary operations which the late war showed to be scarcely less decisive in the final analysis than the clash of opposing battle fleets. Who will deny, for instance, that the escape of the *Goeben* had consequences at least as weighty as those produced by any other naval event of the whole struggle?—*Naval and Military Record*, 8 February, 1922.

NAVAL OFFICERS AS CONSULS.—The Foreign Office, it seems, finds a difficulty in staffing the Consular Service in the Far East, good recruits being by no means plentiful. Lord Northcliffe recently described how the British Consuls out there are badly housed and grossly overworked. Some of the best men, the Consular Department officials declare, are induced to leave their posts by the offer of larger salaries from merchants. We put forward some time ago in this journal a plea for the utilization of retired naval officers in this work, and in view of the state of things now revealed such a policy would evidently be an advantage to the officers and the State. While £800 a year is apparently insufficient to attract young men who have more lucrative prospects elsewhere, it would be welcomed by many officers who have been obliged to leave the Navy owing to the post-war reductions, and whose experience of foreign ports would stand them in good stead in the Consular Service, especially if they could be given a brief course of instruction in trading matters. The value of a seaman in this connection was demonstrated when the *Dresden* escaped into hiding after the Falklands victory in 1914, for of all the people concerned in the search there was only one who found her out, and this was the British Consul at Punta Arenas, Mr. Milward, who had followed the sea in his youth, and whose knowledge enabled him to trace the locality to which the *Dresden's* supplies were going. We recommend the moral of this incident to the attention of the Foreign Office.—*Army, Navy, and Air Service Gazette*, 28 January, 1922.

NAVAL PRISONS.—It is, in a way, evidence of the better class of men now in the Royal Navy that on March 31 the only remaining naval prison, at Bodmin, is to be closed. Twelve years ago there were three such prisons, the others being at Portsmouth and Lewes, but there was a reduction to one after the coming into force of the Naval Discipline Amendment Act of 1909, which provided that offences against discipline might be dealt with by detention, for which purpose detention quarters were provided at each naval barracks. Bodmin naval prison has accommodation for a hundred of the men, but nothing like this total has been there of late years. The average daily number in 1920 was only thirty-four, and it is understood that there was a still further decrease last year. In these circumstances there would seem to be no need whatever for keeping on the establishment, especially since arrangements could be made with the War Office for the accommodation of offenders at the military prison at Woking. The

current estimates show that there is a staff of sixteen at Bodmin—nearly as many as the prisoners—and that the votes for salaries, warders' uniforms, and the like run into nearly £6,000 a year, besides the cost of the upkeep of the prison buildings. So on all grounds the Navy is glad to see the last of its prisons. It could be wished that every economy was as popular with most people as this one.—*Army, Navy and Air Force Gazette*, 4 February, 1922.

BRITISH DESTROYERS FOR FINLAND.—England has offered to Finland at a very low figure six destroyers built in 1914. The chief of the Finnish Naval Staff has left for London with a view to buying the ships.—*Naval and Military Record*, 8 February, 1922.

ADMIRALTY ORDER FOR VICKERS, LTD.—A Barrow message states that Vickers, Ltd., are in receipt of an Admiralty order to construct Diesel engines for a minelayer to be built in the Government dockyard. Whilst there is no official confirmation, there is no denial, and the report is believed to be correct.—*Engineering and Industrial Management*, 19 January, 1922.

DRY-DOCKING OF H. M. S. VICTORY.—Whether the famous flagship of Nelson has now been towed to her final resting place is not yet known, but there will be no surprise if it is decided to keep her permanently in dry-dock No. 2, where she now lies. The vessel will be carefully surveyed, but experts who have had access to the reports made after the earlier examination made when the *Victory* was at her old moorings in Portsmouth Harbor do not think it will be safe to float the ship again. The greatest care was exercised to ensure that she settled correctly on the blocks, and other precautions taken to avoid any undue straining of the hull. It is an advantage that the dry-dock in which the ship now rests is very accessible to the public, being in close proximity to the main gates of the dockyard, and that the dock is not likely to be required for any other purpose.—*Engineering*, 27 January, 1922.

## JAPAN

JAPANESE SHIPBUILDING POLICY.—The Japanese press refers to a meeting held in Tokyo on December 23 at the official residence of the Naval Minister, those present including four members of the House of Peers, who are particularly interested in naval affairs, and several high officials of the Navy Department. Vice-Admiral Ide, who is acting for the Minister during the latter's absence in Washington, explained the navy estimates and replied to questions touching the effects of the American limitation scheme. He stated, *inter alia*, that Japan had endeavored to secure some modification of the naval holiday in order to mitigate the severity of its reaction on the shipbuilding industry, and had also claimed the same ratio of tonnage for aircraft-carriers as was proposed for America and Great Britain; but on both points she had been overruled. Vice-Admiral Okada, the director of naval construction, assured the meeting that even after the construction of capital ships had been suspended, the building of subsidiary vessels would be pushed on. Furthermore, in order to alleviate unemployment, measures would be taken to accelerate the building of some special service ships which it was originally intended to have laid down in the fiscal years 1924 and 1925. These statements appear to corroborate previous reports as to the Japanese intention of building cruisers and lesser craft in place of the cancelled dreadnoughts. As for the "special service ships," which include gunboats, mine-layers, oil-tankers, etc., eighteen of these were authorized under the "eight-eight" project. The cruiser program

is fairly large. It comprises about seven ships building and eight not yet laid down. When to these are added the many destroyers and submarines provided for in the "eight-eight" scheme, the aggregate of tonnage to be completed becomes quite large, and if the Navy Department adheres to its resolve to substitute smaller vessels for the abandoned capital ships, Japanese shipbuilders should have no reason to complain of any dearth of orders.

The Navy Department has not yet decided how to dispose of the uncompleted capital ships affected by the Washington agreement. The battleships *Kaga* and *Tosa* are already afloat, but the battle cruisers *Amagi* and *Akagi* remain on the stocks, and will almost certainly be launched, Japanese experts agreeing that less expenditure is involved in the breaking-up of warships after they have been launched than in dismantling them as they lie on the slip. Work on the battle cruisers *Atago* and *Takao* is proceeding at a leisurely rate, and will not be definitely suspended until the return of the Naval Minister, Admiral Baron Kato. Laborers at the Kure Arsenal continue to agitate for a large bonus in the event of their discharge, and there is much unrest at the other shipyards, both state-owned and private. Even the staunchest advocates of naval retrenchment now admit that a complete cessation of warship construction would probably lead to grave disorders, owing to the high proportion of Japanese wage-earners dependent on such work.

Admiral Chisaka, director of the Kure Naval Academy, is credited with the statement that, owing to the naval limitation scheme, the number of first and second-year students will shortly have to be reduced by half, and that naval cadets would be well-advised to cast about for alternative careers in view of the impending diminution of the fleet.—*Naval and Military Record*, 15 February, 1922.

MANUFACTURE OF AEROPLANES IN JAPAN.—The Mitsubishi Motor Co., at Nagoya, has made progress in the work of manufacturing its new type of aeroplane, and will soon be turning out complete machines. The company's application for permission to establish an aviation field in front of its works at the port has received official sanction.

A trial flight with an experimental aeroplane completed by these works, in which a 300-horsepower Hispano-Suiza motor was installed, showed satisfactory results. The aeroplane was constructed after the plan of a British engineer; while the details of construction are kept secret, it is said to be a high-speed fighting plane, to be known as the Mitsubishi type. The company plans to undertake construction of this type of biplane.

Work has been started by the *Aichi Tokai Denki Kabushiki Kaisha* (Aichi Clock & Electric Machinery Co., Ltd.) on the construction of a factory in the neighborhood of Nagoya to which the works of the company now at Atsuta, will be moved. It is expected that the factory will be completed by the end of 1922. The present works are capable of turning out one aeroplane a month, of the Yokosho type; the new factory will have a capacity of fifty planes a month. Besides the manufacture of airplanes for military purposes, special attention will be given to the production of large commercial planes.

The Kawasaki Works of Kobe are contemplating the erection of aeroplane factories in the Gifu Prefecture. Construction was scheduled to be started in November, 1921, and to be completed in the spring of 1922, when 500 workmen will be detached from Kobe to engage in the manufacture of aeroplanes.—*Aerial Age Weekly*, 27 February, 1922.

BIG JAPANESE FIRM ACCUSED OF DEFRAUDING GOVERNMENT.—Charges that the Kawasaki Dockyards Company for ten years has been forging seals of approval on materials for warships, merchant vessels, railway cars, and



other large products, which have been rejected by inspectors of Lloyds, the Navy and the Japanese Railway Department, thereby profiting by 5,000,000 to 10,000,000 yen (\$5,000,000), are made through the columns of the Japanese press. Kojiro Matsukata, president of the company, denies the charges, saying:

"The alleged scandal is merely the work of laborers who were dismissed from our plant because of lack of discipline." It is generally believed that men discharged from the plant last summer are responsible for the publicity at this time.

The *Tokio Asahkio* publishes a photograph alleged to be of a false seal. Mr. Kawashima and Tomitaro Shibata, members of the Kobe branch of the Japan League of Labor, have issued the following statement:

"The Kawasaki dockyards have been deliberately deceiving the authorities. We have good evidence of this. The dockyards are supposed to supply materials according to a fixed standard, but have been supplying bad materials by use of false seals.

"In view of the large loss through machine parts failing to pass inspection, the company especially made test pieces to be used to deceive the inspectors. With these and false seals which the company ordered made, the company has been carrying on deceit on a gigantic scale, of which we now possess six cases of evidence."

The statement further declares that Navy Inspector Onodera is alleged to have had knowledge of the forgeries.—*Philadelphia Public Ledger*, 20 February, 1922.

**JAPAN AND ARMAMENTS.**—The Japanese Embassy announces that it is unofficially reported from Tokio that it has been decided to reduce Maizuru, hitherto one of the most important naval stations in Japan, to the rank of a naval port.

It is further stated that the naval station of Port Arthur will be thrown open before long as an ordinary commercial port or open harbor.

With regard to the Army, the Kokuminto party (nationalists) proposed a measure to the Diet for reducing the army by one half. The Government party, while not going so far as the Nationalists, has introduced a bill in the House of Representatives with the object of reducing the personnel of the army and effecting reforms in the scope of organization.—*Naval and Military Record*, 15 February, 1922.

**JAPAN'S SHIPBUILDING OUTPUT.**—At the present time there are fourteen Japanese shipbuilding establishments capable of constructing ocean-going merchant ships as compared with a total of fifty-three yards in 1918. Of these fourteen plants only nine are actually engaged in new construction. The output of Japanese yards has fluctuated as follows since 1913:

Year	No. of Ships	Gross Tons
1914.....	16	78,010
1915.....	8	40,485
1916.....	40	141,827
1917.....	89	348,430
1918.....	189	518,786
1919.....	136	621,513
1920.....	93	433,265
1921.....	40	*190,000
*Estimated.		

The largest merchant vessel built last year was the twin screw steamer *Hakone Maru* of 10,500 gross tons, which was constructed at the Nagasaki works of the Mitsubishi Shosen Kaisha for the Nippon Yusen Kaisha. She is a combination passenger and cargo carrier and has a speed of 16 knots. Her propelling machinery consists of two sets of Parsons double-reduction geared turbines.

For the Toyo Kisen Kaisha, the Asano Shipbuilding Company completed in 1921 the *Biyo Maru*. This is the first electrically propelled steamer to be built in Japan. She is reported to be giving every satisfaction in service and to consume very little fuel as compared with sister cargo carriers fitted with geared turbines. She is of 8,800 tons deadweight.

Last year also witnessed the completion for the Teikoku Steamship Company of the steamers *Tachibana Maru* and *Manju Maru* designed for the carrying of oil in bulk. They are of 8,800 tons deadweight and were built on the Isherwood plan at the Harima yard of Messrs. Suzuki & Co. These two vessels, together with the *Kiyo Maru* and a small iron tanker, are the only privately-owned tank steamers under Japanese registry.—*Nautical Gazette*, 11 February, 1922.

## UNITED STATES

## NAVY DEPARTMENT

## BUREAU OF CONSTRUCTION AND REPAIR

WASHINGTON, D. C., FEBRUARY 10, 1922.

## VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—PROGRESS AS OF JANUARY 31, 1922

Type Number and Name		Contractor	% of Completion			
			Feb. 1, 1922		Jan. 1, 1922	
Total	On Ship	Total	On Ship			
BATTLESHIPS (BB)						
45	Colorado	New York S. B. Cpn.	87.9	86.8	86.	84.9
47	Washington	New York S. B. Cpn.	75.3	69.4	69.8	63.6
48	West Virginia	Newport News S. B. & D. D. Co.	73.	69.2	70.	65.4
49	South Dakota	New York Navy Yard	38.5	31.6	38.	31.1
50	Indiana	New York Navy Yard	34.6	27.1	34.3	26.8
51	Montana	Mare Island Navy Yard	27.6	19.	27.6	19.
52	North Carolina	Norfolk Navy Yard	36.7	27.1	36.7	27.1
53	Iowa	Newport News S. B. & D. D. Co.	31.5	27.1	31.2	26.5
54	Massachusetts	Beth. S. B. Cpn. (Fore River)	11.	4.3	11.	4.3
BATTLE CRUISERS (CC)						
1	Lezington	Beth. S. B. Cpn. (Fore River)	33.2	23.4	31.1	21.4
2	Constellation	Newport News S. B. & D. D. Co.	22.3	19.1	20.	17.6
3	Saratoga	New York S. B. Cpn.	33.7	26.7	32.4	25.4
4	Ranger	Newport News S. B. & D. D. Co.	4.	1.5	3.8	1.4
5	Constitution	Philadelphia Navy Yard	13.3	8.3	12.8	7.8
6	United States	Philadelphia Navy Yard	12.	7.	11.8	6.8
SCOUT CRUISERS (LIGHT CRUISERS) (CL)						
4	Omaha	Todd D. D. & Const. Cpn.	99.2	94.3	99.	93.
5	Milwaukee	Todd D. D. & Const. Cpn.	94.	86.5	93.6	86.2
6	Cincinnati	Todd D. D. & Const. Cpn.	88.	81.6	87.6	81.2
7	Raleigh	Beth. S. B. Cpn. (Fore River)	63.7	45.6	63.7	45.6
8	Detroit	Beth. S. B. Cpn. (Fore River)	79.1	64.8	76.9	61.6
9	Richmond	Wm. Cramp & Sons Co.	85.	79.	83.	77.
10	Concord	Wm. Cramp & Sons Co.	82.	75.	79.	71.
11	Trenton	Wm. Cramp & Sons Co.	57.	46.	55.	43.
12	Marblehead	Wm. Cramp & Sons Co.	47.	33.	47.	33.
13	Memphis	Wm. Cramp & Sons Co.	40.	26.	40.	26.
AUXILIARIES						
Repair Ship No. 1, Medusa (AR1) Puget Sound Navy Yard			75.9	66.6	74.1	62.7
Dest. Tender No. 3, Dobbin (AD3) Philadelphia Navy Yard			67.5	67.2	66.9	66.6
Dest. Tender No. 4, Whitney (AD4) Boston Navy Yard.			49.6	40.4	47.1	37.8
Sub. Tender No. 3, Holland (AS3) Puget Sound Navy Yard.			21.5	5.5	21.5	5.5
PATROL VESSELS						
Gunboat No. 22, Tulsa (PG22), Charleston Navy Yard.			72.	59.	71.3	57.5
DESTROYERS						
339	Trever	Mare Island Navy Yard.	99.6	99.6	98.8	98.8
340	Perry	Mare Island Navy Yard.	87.7	87.7	86.	85.7
341	Decatur	Mare Island Navy Yard	83.3	83.3	82.1	81.8

Destroyers authorized but not under construction or contract (12) Nos. 348 to 359 inclusive.

Under Construction: 4 fleet submarines and 37 submarines. Authorized but not under construction or contract: 6 fleet submarines and 1 submarine.

**BIDS FOR NAVAL SPOTTERS.**—The Bureau of Aeronautics of the Navy has just asked American airplane manufacturers for bids on a small number of a new spotting seaplane, designed by the construction division of the Naval Bureau of Aeronautics, the details of which are not revealed. These planes are to be used for spotting the fire of the guns of the fleet, and it is believed they will be small fast craft carrying two or three men. Detailed plans of the new seaplanes have been submitted to airplane manufacturers, so that they can make definite bids for three each, though the total number to be ordered was not announced.—*Aviation*, 20 February, 1922.

**JANUARY SHIPBUILDING OUTPUT IN DETAIL.**—The Bureau of Navigation, Department of Commerce, reports seventy-one sailing, steam, gas, and unrigged vessels of 52,764 gross tons built in the United States and officially numbered during the month of January, 1922, as follows:

	Atlantic and Gulf		Pacific		Great Lakes		Western Rivers		Total	
	No.	Gross	No.	Gross	No.	Gross	No.	Gross	No.	Gross
<b>WOOD</b>										
Sailing.....	1	8	1	17	..	....	..	....	2	25
Steam.....	..	....	..	....	..	....	2	157	22	157
Gas.....	20	277	3	33	1	12	5	52	29	374
Unrigged.....	23	8,955	3	583	..	....	3	121	29	9,659
Total.....	44	9,240	7	633	1	12	10	330	62	10,215
<b>METAL</b>										
Sailing.....	..	....	..	....	..	....	..	....	7	42,447
Steam.....	6	32,609	1	9,838	..	....	..	....	..	....
Gas.....	1	86	1	16*	..	....	..	....	2	102
Unrigged.....	..	....	..	....	..	....	..	....	..	....
Total.....	7	32,695	2	9,854	..	....	..	....	9	42,549
<b>TOTALS</b>										
Sailing.....	1	8	1	17	..	....	..	....	2	25
Steam.....	6	32,609	1	9,838	..	....	2	157	9	42,604
Gas.....	21	363	4	49*	1	12	5	52	31	476
Unrigged.....	23	8,955	3	583	..	....	3	121	29	9,659
Grand total....	51	41,935	9	10,487*	1	12	10	330	71	52,764

\*Includes one composite vessel of 16 gross tons.

The above total includes twenty-nine rigged vessels of 10,541 gross tons and twenty-four unrigged vessels of 9,283 gross tons, total fifty-three vessels of 19,824 gross tons built in years previous to 1922. Of the above total, one vessel of 14,187 gross tons was built for the United States Shipping Board.

The largest vessel built during the month was the *Peninsula State* of 14,187 gross tons. Other large vessels include the *W. S. Rheem*, 9,838 gross tons, *Delaware Sun*, 8,964 gross tons, and *Macy Willis*, 7,096 gross tons.—*Nautical Gazette*, 18 February, 1922.

**TABLE OF PROPOSED NEW BASE PAY AND ALLOWANCES.**—This table embodies the provision for service pay and allowances in the bill as drafted by the joint Congressional Committee. While in this compilation the titles used are those of the Army, the rates apply, of course, to corresponding grades of the other services.

—*Army and Navy Journal*, 25 February, 1922.

**LEVIATHAN CONTRACT AWARDED TO NEWPORT NEWS YARD.**—The Shipping Board has decided to award the contract for reconditioning the liner *Leviathan* to the Newport News Shipbuilding and Dry-Dock Company which was the lowest bidder for the repair work. Its bid was \$8,200,000, and involved an expenditure of \$28,000 on its part in making a survey of the liner.

	Rental allowances							Ration allowances				
	Base pay	1 to 3 yrs	4 to 6 yrs	7 to 9 yrs	10 to 12 yrs	13 to 15 yrs	16 to 18 yrs	19 to 21 yrs	22 to 24 yrs	25 to 27 yrs	28 to 30 yrs	Over 30 yrs
General—	\$13,500	\$13,500	\$13,500	\$13,500	\$13,500	\$13,500	\$13,500	\$13,500	\$13,500	\$13,500	\$13,500	\$13,500
Major General.....	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500
Brigadier General.....	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500
Colonel—												
Over 26 years' service.....	4,000	4,400	4,600	4,800	5,000	5,200	5,400	5,600	5,800	6,000	6,000	6,000
First appointment above captain.....	4,000	4,200	4,400	4,600	4,800	5,000	5,200	5,400	5,600	5,800	6,000	6,000
Appointed under Sec. 24, Act June 4, 1920.....	4,000	4,200	4,400	4,600	4,800	5,000	5,200	5,400	5,600	5,800	6,000	6,000
Less than 26 years' service.....	3,500	3,675	3,850	4,025	4,200	4,375	4,550	4,725	4,900	5,075	5,250	5,250
Lieutenant Colonel—												
Over 36 years' service.....	4,000											
Over 20 and less than 30 years' service.....	3,500											
First appointment under second lieutenant.....	3,500											
Appointed under Sec. 24, Act June 4, 1920.....	3,500											
Less than 20 years' service.....	3,000	3,150	3,300	3,450	3,600	3,750	3,900	4,050	4,200	4,350	4,500	4,500
Major—												
Over 23 years' service.....	3,500											
Over 14 and less than 23 years' service.....	3,000											
First appointment above second lieutenant.....	3,000											
Appointed under Sec. 24, Act June 4, 1920.....	3,000											
Less than 14 years' service.....	2,400	2,520	2,640	2,760	2,880	3,000	3,120	3,240	3,360	3,480	3,600	3,600
Captain—												
Over 17 years' service.....	3,000											
Over 7 and less than 17 years' service.....	2,400											
First appointment above second lieutenant.....	2,400											
Present rank July 1, 1920 or earlier.....	2,400											
Less than 7 years' service.....	2,000											
First Lieutenant—												
Over 10 years' service.....	2,400											
Over 3 and less than 10 years' service.....	2,000											
First appointment above second lieutenant.....	2,000											
Less than 3 years' service.....	1,500											
Second Lieutenant—												
Over 5 years' service.....	2,000											
Less than 5 years' service.....	1,500											

	Rental allowances		Ration allowances	
	With dependents	Without dependents	Numbers of ration allowances	With dependents
(Allowance fixed by the President)				
General—	\$1,440†	\$960†	3	\$474.50
Major General.....	1,440†	960†	3	474.50
Brigadier General.....	1,440†	960†	3	474.50
Colonel—				
Over 26 years' service.....	1,440†	960†	3	474.50
First appointment above captain.....	1,440†	960†	3	474.50
Appointed under Sec. 24, Act June 4, 1920.....	1,440†	960†	3	474.50
Less than 26 years' service.....	1,440	960	3	711.75
Lieutenant Colonel—				
Over 36 years' service.....	1,440	960	2	474.50
Over 20 and less than 30 years' service.....	1,440	960	3	711.75
First appointment under second lieutenant.....	1,440	960	3	711.75
Appointed under Sec. 24, Act June 4, 1920.....	1,440	960	3	711.75
Less than 20 years' service.....	1,200	720	3	711.75
Major—				
Over 23 years' service.....	1,440	960	3	711.75
Over 14 and less than 23 years' service.....	1,200	720	3	711.75
First appointment above second lieutenant.....	1,200	720	3	711.75
Appointed under Sec. 24, Act June 4, 1920.....	1,200	720	3	711.75
Less than 14 years' service.....	960	720	2	474.50
Captain—				
Over 17 years' service.....	1,200	720	3	711.75
Over 7 and less than 17 years' service.....	960	720	2	474.50
First appointment above second lieutenant.....	960	720	2	474.50
Present rank July 1, 1920 or earlier.....	960	720	2	474.50
Less than 7 years' service.....	720	480	2	474.50
First Lieutenant—				
Over 10 years' service.....	960	720	2	474.50
Over 3 and less than 10 years' service.....	720	480	2	474.50
First appointment above second lieutenant.....	720	480	2	474.50
Less than 3 years' service.....	480	480	1	237.25
Second Lieutenant—				
Over 5 years' service.....	480	480	2	474.50
Less than 5 years' service.....	480	480	1	237.25

\* The maximum pay of a lieutenant colonel shall not exceed \$5,750.

†The maximum allowances which will accrue to an officer below the grade of brigadier general, and a major general will be such as will not exceed \$7,200, \$8,000, and \$9,800, respectively, as pay and allowances combined.

Since the Board invited tenders for the *Leviathan's* reconstruction, considerable pressure has been brought to bear to have the work performed at the Boston Navy Yard. In justice to the eight private concerns which submitted bids, however, the Administration has felt that it could not in good faith fail to accept the lowest tender.—*Nautical Gazette*, 18 February, 1922.

ICE PATROL RESUMED.—Halifax will again be the headquarters of the U. S. Coast Guard Cutter *Seneca*, which with a sister ship has been detailed to the work of patrolling the Grand Banks and vicinity in accordance with the arrangement made by the International Convention for Safety of Life at Sea adopted at London in 1914.

The *Seneca* and *Androskoggin*, which were on the ice patrol last spring, did very valuable work. They keep in touch with the ice situation, make observations of the quantities of ice, its kind, extent and drift, and obtain all other information of value for the guidance of navigators, together with oceanographical and meteorological observations.—*Nautical Gazette*, 25 February, 1922.

VESSELS SOLD TO FOREIGNERS.—With the consent of the Shipping Board, twenty-one American vessels aggregating 20,696 tons were transferred to foreign flags during the month of January. The largest of these were the following five wooden steamers:

	Gross Tons	Flag
<i>Neabasco</i> .....	3,353	British
<i>Airtie</i> .....	2,799	British
<i>Thalia</i> .....	2,799	British
<i>Oneco</i> .....	2,571	British
<i>Coyote</i> .....	2,551	French

—*Nautical Gazette*, 18 February, 1922.

LAST FOUR COMBINATION STEAMERS ALLOCATED BY SHIPPING BOARD.—Allocation of the entire fleet of the 535 and 502-foot type combination passenger and cargo steamships built by the Emergency Fleet Corporation has been announced by the Shipping Board. The last four of these models to be completed have been assigned to the Munson and United States Lines. The latter will place the *Lone Star State* and the *Peninsular State* in the North Atlantic service and the *Palmetto State* and *Nutmeg State* will be operated on the New York to Buenos Aires run by the Munson Lines. In addition, the *Buckeye State* and the *Hawkeye State* will be temporarily assigned to the United States Lines for European trade.

Eleven of the fleet are assigned for operation in the Pacific trade and two additional, the *Hawkeye State* and the *Buckeye State*, will be re-allocated to it in time for the summer season traffic. Four will be in the South American and six in the European service. The Pacific Mail Steamship Co. is to maintain its San Francisco, India, China, and Japan routes with six ships and the Pacific Steamship Co. has been assigned five for the Seattle to China and Japan service. One of these is the *Pine Tree State*, which holds the speed record of eight days, nineteen hours and thirty minutes between Yokohama and Seattle.

The Munson Lines are operating the *Southern Cross* and *American Legion*, the latter holding the record for the New York to Buenos Aires run, and two more will be put on the same route in March. The two now in operation will then be temporarily withdrawn for the installation of larger fuel tanks. The United States Lines are at the moment entrusted with eight of these combination vessels, four are now on scheduled sailings. The *Buckeye State* and *Hawkeye State* will take the place of two of the larger passenger liners, which will be temporarily withdrawn from service. These two, when returned to the Pacific, will be operated by a new company in a Los Angeles-Hawaiian service.

The *Peninsular State*, one of the new ships assigned to the United States Lines, is undergoing its final trials and is scheduled to sail on February 18. The *Lone Star State*, also allocated to the U. S. Lines, is about ready for service and the two new Munson assignments, the *Palmetto State* and the *Nutmeg State*, will be ready in the course of several weeks. These four are all 535s and are the last of the larger combination passenger and cargo ships on the Fleet Corporation's program to be completed.

Allocation of the entire fleet is shown in the accompanying table:

Operating Company	Name of Vessel	Name of State	Length of Vessel	Service to be Used in
Munson S. S. Co.	<i>American Legion</i>	.....	535 feet	N. Y. to Buenos Aires
Munson S. S. Co.	<i>Southern Cross</i>	.....	535 feet	N. Y. to Buenos Aires
Munson S. S. Co.	<i>Palmetto State</i>	South Carolina	535 feet	N. Y. to Buenos Aires
Munson S. S. Co.	<i>Nutmeg State</i>	Connecticut	535 feet	N. Y. to Buenos Aires
Pacific Mail S. S. Co.	<i>Empire State</i>	New York	535 feet	San Francisco to Orient
Pacific Mail S. S. Co.	<i>Hoosier State</i>	Indiana	535 feet	San Francisco to Orient
Pacific Mail S. S. Co.	<i>Golden State</i>	California	535 feet	San Francisco to Orient
Pacific Mail S. S. Co.	<i>Creole State</i>	Louisiana	502 feet	San Francisco to Orient
Pacific Mail S. S. Co.	<i>Granite State</i>	Vermont	502 feet	San Francisco to Orient
Pacific Mail S. S. Co.	<i>Wolverine State</i>	Michigan	502 feet	San Francisco to Orient
United States Lines	<i>Panhandle State</i>	West Virginia	502 feet	N. Y. to European ports
United States Lines	<i>Centennial State</i>	Colorado	502 feet	N. Y. to European ports
United States Lines	<i>Old North State</i>	North Carolina	502 feet	N. Y. to European ports
United States Lines	<i>Blue Hen State</i>	Delaware	502 feet	N. Y. to European ports
United States Lines	<i>Hawkeye State</i>	Iowa	535 feet	N. Y. to European ports
*United States Lines	<i>Buckeye State</i>	Ohio	535 feet	N. Y. to European ports
*United States Lines	<i>Lone Star State</i>	Texas	535 feet	N. Y. to European ports
United States Lines	<i>Peninsular State</i>	Florida	535 feet	N. Y. to European ports
Pacific S. S. Co.	<i>Wenatchee</i>	.....	535 feet	Seattle to Orient
Pacific S. S. Co.	<i>Bay State</i>	Massachusetts	535 feet	Seattle to Orient
Pacific S. S. Co.	<i>Keystone State</i>	Pennsylvania	535 feet	Seattle to Orient
Pacific S. S. Co.	<i>Pine Tree State</i>	Virginia	535 feet	Seattle to Orient
Pacific S. S. Co.	<i>Silver State</i>	Nevada	535 feet	Seattle to Orient

\*To be reallocated to new Los Angeles-Hawaiian Line.

—*Nautical Gazette*, 4 February, 1922.

SHIP WORM IN NEW YORK WATERS.—The National Research Council and the Engineering Foundation announce that the dreaded *teredo navalis* or ship worm has gained entrance to New York Harbor waters. It has been found in Barnegat Bay and in other nearby places. This particular borer multiplies with extraordinary rapidity and attacks the under-water portions of wooden piers and wooden ships. Steps are being taken to combat this menace. The usual treatment is with creosote or corrosive sublimate.—*Nautical Gazette*, 25 February, 1922.

WORLD'S ONLY SIX-MASTERS.—The only six-masted sailing vessels now afloat are the American schooners *Ruth E. Merrill*, *Edward J. Lawrence*, and *Wyoming*. Though at one time there were nearly a dozen six-masted American schooners in the coastwise coal trade, they came to various untimely ends, and none have been built in several years. The only seven-masted vessel ever constructed, the *Thomas W. Lawson*, was wrecked a number of years ago on the Irish coast.

The largest of the vessels yet in service is the *Wyoming*. She is of 3,730 gross tons and can carry more than 6,000 tons of coal, her cargo capacity being greater than that of many steamers. Built in 1909 at Bath Me., the home of schooners, the *Wyoming* has had a peculiar history. In the first five years of her life, when she was employed in the coastwise coal trade, she paid for herself. Her cost was about \$160,000. Then, at the beginning of the war she was sold to the France and Canada Steamship Corporation, the price received being in the neighborhood of \$400,000. In the last three years schooner prices dropped like a shot and she was acquired, not long ago, by Captain Griffin, her present master, and associates for \$36,000.

The *Wyoming* was purchased by the syndicate from the France and Canada Steamship Corporation, together with four other vessels, all well-known craft, for the sum of \$115,000. The other schooners are the *Cora Cressy*, *Edward J. Lawrence*, *Dorothy Palmer* and *Oakley C. Curtis*. It is believed that the former owners paid nearly \$2,000,000 for the five ships during the war.—*Nautical Gazette*, 11 February, 1921.

### AERONAUTICS

**THIRTY-FOUR KILLED IN CRASH OF THE ROMA.**—Thirty-four officers, enlisted men and civilians were killed on February 21 when the Army dirigible airship *Roma* plunged a thousand feet and crashed to earth in flames near the Hampton Roads army base. Only eleven of the forty-five men aloft with her were saved, and some of them were terribly hurt. Three were slightly injured.

The breaking of the rudder with its vertical controls, affixed in box-kite fashion to the stern, is believed the original cause of the disaster. Just as the craft plummeted into the earth the metal-clad nose struck high-tension electric power wires, and the dirigible was fired from stern to stern.

Only those whose fortunate positions in the car enabled them to leap before the flames ran with lightning speed through the gas bag, had the faintest chance for their lives. The thirty-three who couldn't jump died. One officer broke his neck in a dive to earth and was dead before he could be got to a hospital.

#### Many Officers Among Dead

The crushed, misshapen mass that thudded onto the field was a funeral pyre of such intense heat that the agonies of those who were not killed in the crash must have been mercifully brief. The bodies were burned beyond recognition and the slow work of listing the victims was carried out partly by a process of elimination and partly through non-combustible objects that the aviators had carried in their pockets. That list when it was completed showed that two majors, four captains, and seven lieutenants were among the lost.

The *Roma's* gas bag, with its cubical capacity of 1,100,000 feet, was filled with hydrogen. Non-inflammable helium was the levitating gas used when the *Roma*, which was bought from the Italian Government, went on her first trial flight last December. But it had been planned to send the ship—the largest semi-rigid airship in the world—on a spring cruise over the country to demonstrate her fitness to cross the Atlantic. In her bag had been the whole available supply of helium in the United States. Flying officials wanted that for the spring journey, so they pumped it into tanks and substituted hydrogen.

#### Trip to Test Liberty Motors

The occasion for the fatal flight was a desire to test the Liberty Motors which had been installed to replace the Italian motors.

In charge of Captain Dale Mabry, with a full complement of officers and men and a few civilian guests, the huge craft went aloft from Langley Field at 1:30 o'clock in the afternoon. It was just forty-nine minutes later that she lay in ruins, with most of those who had gone up in gay holiday mood dead in the wreckage.

The whole story was compressed into the last minute or so. In that time Captain Mabry and Lieut. Byrum G. Burt, at the control wheels, had striven with every resource of courage and skill to guide the wobbling airship to a safe landing. Others trained for swift action in just such pinched seconds had played their part by hurling overboard bag

after bag of sand ballast. An instant later the falling airship came into contact with the electric wires, charged with 2,300 volts, that supply current to the army base, and the explosion and fire followed.

Lieutenant W. E. Riley, a member of the official crew, jumped from a window of the cabin when the explosion came. His parachute failed to work properly and he struck the street pavement on his head. His neck was broken and he died before reaching the hospital.

There was just one man who leaped and landed on soft ground. He escaped almost unhurt with the exception of a few burns on his face and hands. He is Lieutenant Byrum G. Burt. He jumped from the *Roma* when she was about thirty feet in the air. He landed in the mud on the shore of Hampton Roads.

Captain Walter G. Reed, who stood by the ship to the last and did all he could to help others, came out of the burning mass of steel and wood and rags with just a few scars on his ears and hands. He says he does not know why he is alive. Of all the line officers on the *Roma* only two escaped death—Captain Reed and Lieutenant Burt.

### Falls Across Railroad Track

The airship fell directly across a railroad track, the elevator and rudder falling on and remaining suspended from a telegraph pole. At one side of the track was a stack of steel parts of railway cars, on the other was a big heap of pigiron. It was into the pile of iron scraps that the passenger car of the dirigible smashed.

Rescuers from the Army Supply Depot rushed to the scene, and many daring attempts were made to penetrate the smoke and gas to rescue those in the ship. It was several hours before the car of the airship could be reached, and then only after army, navy, and civilian fire-fighting forces had quenched the flames. The rescue work was also delayed until huge army derricks were brought to the scene to lift the steel wreckage from the car.

Major General Mason M. Patrick, Chief of Air Service, who flew to the scene of the disaster a few hours after it occurred, sent the following telegram to the Adjutant General on February 22:

"Have ordered thorough investigation to determine cause of *Roma* disaster. Information already gathered indicates that cable to elevating rudders broke. Ship nosed down. Struck live wires carrying high tension electric current and this started fire. There was no explosion and no fire until after those wires were hit and broken.

"PATRICK."

General Patrick also reported orally that the accident to the elevating rudders of the *Roma* occurred at an elevation of only 600 feet.

### Crew of Picked Men

The *Roma's* crew was picked from the men stationed at Langley Field. They were said to be among the best airmen at the big army post. Each man was assigned to certain duties, and each man was an expert at the duties assigned to him.

It is the opinion of all survivors, as well as of observers of the disaster, that the officers in charge of the craft, the operating crew, and others aboard acted most admirably and coolly under the harrowing circumstances. They are declared to have stuck to their posts as long as it was possible to do anything with the ship, a number dying at their posts of duty.

In the flight, on what was to have been a speed trial with her four Liberty motors, each of 400 horsepower, the *Roma* was to have tried to maintain a speed of 100 miles an hour. It was the first time up with the



new motors, and the first time she had ever attempted to make any unusual speed.

The *Roma* had not been out of her hangar at Langley Field for several weeks.—*Army and Navy Journal*, 25 February, 1922.

**THE CURTISS TWIN-ENGINE TORPEDO SEAPLANE.**—The Curtiss Aeroplane & Motor Corporation of Garden City, L. I., has recently turned over to the Navy Department a very interesting torpedo seaplane known as the *Curtiss CT* (Curtiss Torpedoplane). This is one of the most advanced designs yet produced in the country and shows that American military airplane design is able to keep pace with that of any other country in the world; in fact this machine would appear to be without a rival as far as excellence of design is concerned.

The machine is a cantilever monoplane with the engine mounted practically in the wings. The engines are Curtiss CD12's and drive tractor propellers. The cooling is by two Lamblin radiators mounted under the engine nacelles under the wing. The fuel tanks are in the wings between the engine nacelles and the central nacelle. The engine instruments are mounted on the side of the nacelle in plain view of the pilot; in fact they are only about 3 feet from his head and on a level with it.

The entire machine, except for the wing covering, is built of wood. The wings are covered with fabric and taper both in chord and camber from the root to the tip. They have a span of 65 feet. The maximum thickness of the wings is 30 inches and the chord at the root 16 feet, which gives a maximum wing depth of 15.6 per cent. It is expected that future models will be constructed of metal and will be somewhat lighter.

The undercarriage consists of two floats, one under each engine. This arrangement obviates the need of wing tip floats and the main floats are sufficiently long to allow the designer to dispense with any tail floats also. The empennage is supported on booms, one of a pair running from the rear end of the float and the other from the rear of the engine nacelle, the pairs being parallel. There are four booms altogether. There are two vertical fins and two balanced rudders. The method of rudder control is very interesting. There is only one control horn on each rudder; these horns are in the space between the rudders. The tips of the balanced portions are connected together by a wire. Thus a pull on one control horn is transmitted through the rudder to the balance wire and by that means to the other rudder. The rudders are located directly behind the propellers and hence are in the slipstream, which arrangement makes for excellent control.

This machine has a high speed of 112 m.p.h. With only one engine running it loses only about 100 feet per minute. It is expected that with metal construction the machine will be able to fly level on one engine. The useful load is about 3,800 pounds consisting of fuel and oil, crew, and a standard torpedo or bomb load. The crew consists of a gunner, pilot, and assistant pilot. The pilot also acts as the bomber.

There are several very ingenious gadgets on this machine. Among these may be mentioned the stands for the mechanics to work on the engines from. These are shelves that pull in and out of the wing on each side of the engines. Handgrips on the sides of the central nacelle and steps on the undercarriage struts provide easy access and exit.—*Aviation*, 6 February, 1922.

#### AIR STRENGTH OF THE GREAT POWERS

Tables Prepared by Sub-Committee on Aircraft of Washington Conference  
Give Authorized and Actual Air Strength Data for United States, France,  
Great Britain, Italy, and Japan

**AUTHORIZED STRENGTHS**

## Heavier-Than-Air

Active and Immediate Reserve Aircraft—Service Type

## Types of Planes

	CHASE (Pursuit or Combat)	ATTACK, DAY	BOMBING OR TORPEDO NIGHT	OBSERVATION (Spotting, Photographing, Artillery Control, Infantry Contact Patrol)	Long Distance Observation or Scouting
Classification of Units in Which Aircraft or Personnel Are Maintained					
United States	64	48	*A 184	234	—
Great Britain	45	445	144	172	—
France	45	445	144	172	—
Italy	45	445	144	172	—
Japan	45	445	144	172	—
United States	64	48	*A 184	234	—
Great Britain	45	445	144	172	—
France	45	445	144	172	—
Italy	45	445	144	172	—
Japan	45	445	144	172	—
Cadre or Other Part Strength Squadrons Home.....	10	—	—	—	—
Aboard.....	—	—	—	—	—
Squadrons Abroad.....	10	—	—	—	—
Headquarters, Schools Training Establishments Home.....	138	24	28	188	96
Aboard.....	—	—	—	—	—
Other State Owned Organizations Home.....	—	—	—	—	—
Aboard.....	—	—	—	—	—
TOTALS Home.....	312	69	473	636	340
Aboard.....	64	48	—	43	193
Total	376	117	473	679	533
United States	376	117	473	679	533
Great Britain	—	—	—	—	—
France	—	—	—	—	—
Italy	—	—	—	—	—
Japan	—	—	—	—	—
Grand Total	376	117	473	679	533

## Active Personnel

PILOTS									
Officers			N. C. O.			Enlisted			
United States	Great Britain	France	Italy	Japan	United States	Great Britain	France	Italy	Japan
Home.....	1904	—	25800	950	500	80	—	—	8000
*1									
Abroad.....	369	—	6500	30	—	0	—	—	440
*C									
Total.....	2273	30,880	32,300	980	500	80	—	—	8440

\*A. Although the totals are correct, the numbers shown in each column are only approximate, as many of the airplanes employed by the Royal Air Force could be classified under more than one heading.

\*B. The authorized strength of these units varies according to the immediate requirements of the service.

\*C. This figure represents the maximum number of personnel up to which the Royal Air Force is authorized to mobilize without Parliamentary legislation.

\*D. There is no period of service stipulated for officers of the Royal Air Force, with the exception of a small percentage who serve on short service commissions for four years. N.C.O.s and men serve for varying periods, which range from five years with the colors and three on the reserve, to twelve years with the colors.

\*1. Approximately two thirds of pilots are officers.

\*2. The pilots are breveted mostly in civilian schools and enlist from them into the squadrons.

## Duration of Service

COUNTRY	Method of Enlisting		Pilots		N. C. O.		Non-flying Personnel	
					Officers			
United States....	Voluntary	*D	Permanent	1 to 4 years	*D	1 to 4 years	*D	1 to 4 years
Great Britain....	Voluntary	*D						
*2								
France.....	Conscription	2 years	2 years	2 years				
Italy.....	Voluntary and Compulsory	NOT DEFINITE	8 months and more					
Japan.....	Voluntary and Compulsory	No definite duration	More than 1 year					

"Home" for United States includes: The forty-eight States and one territory within the continental limits of North America.

"Abroad" for United States includes: Alaska, Hawaiian Islands, Philippines, Guam, Haiti, San Domingo, Panama Canal Zone, St. Thomas, etc.

"Home" for Great Britain includes: British Isles and Ireland.

"Abroad" for Great Britain includes: India, Mesopotamia, Egypt and Mediterranean.

# Lighter-Than-Air

Active and Immediate Reserve Aircraft

Active Personnel

RIGIDS										SEMI AND NON-RIGIDS					BALLOONS					OFFICERS					N.C.O.					ENLISTED																																							
United States					Great Britain					France					Italy					Japan					United States					Great Britain					France					Italy					Japan																								
1 <sup>a</sup> —					1					*b—					9					—					12					2 <sup>b</sup> 3					AS					—					23					10					7														
Active.....					—					—					1					—					—					3					—					1					RE-					—					60					4					3				
Reserve.....					—					—					—					—					—					—					—					—					—					—					—					—					—				
Total.....					1					—					2					—					9					—					15					2					4					QUIRED					83					14					10				

Home.....					207					—					3700					—					28					20					—					—					406					2912					—				
Abroad.....					49					—					500					—					0					—					—					—					600					—					—				
Total.....					256					—					4200					—					28					20					—					—					406					3512					—				

\*a Not yet built.  
 \*b Not fixed whether rigid or semi-rigid.

## Heavier-Than-Air

### Active and Immediate Reserve Aircraft—Service Types

## TYPES OF PLANES

[illegible]

## Active Personnel

	Officers			PILOTS			N.C.O.			Enlisted					
	United States	Great Britain	France	Italy	Japan	United States	Great Britain	France	Italy	Japan	United States	Great Britain	France	Italy	Japan
Home....	928	1734	21,900	450	275	78	—	—	—	—	9530	20,254	—	5525	250
Abroad...	115	651	6,500	30	—	3	—	—	—	—	1870	6,331	—	325	—
Total.....	1043	2385	28,400	480	275	81	—	—	—	—	11,400	26,585	—	5850	250

\*A \*B \*D (See Heavier-than-air).

\*2 (See Heavier-than-air).

## Duration of Service

COUNTRY	Pilots			Method of Enlisting			Officers			N. C. O.			Non-flying Personnel		
	United States	Great Britain	France	Italy	Japan	United States	Great Britain	France	Italy	Japan	United States	Great Britain	France	Italy	Japan
United States	Voluntary	Voluntary	Conscription	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary	PERMANENT	PERMANENT	PERMANENT	PERMANENT	1 to 4 years	1 to 4 years	1 to 4 years	1 to 4 years	1 to 4 years
Great Britain	Conscription	Conscription	Conscription	Conscription	Conscription	Conscription	Conscription	Conscription	Conscription	Conscription	2 years	2 years	2 years	2 years	2 years
France	Conscription	Conscription	Conscription	Conscription	Conscription	Conscription	Conscription	Conscription	Conscription	Conscription	2 years	2 years	2 years	2 years	2 years
Italy	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	More than 8 months	More than 8 months	More than 8 months	More than 8 months	More than 8 months
Japan	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	Voluntary and Compulsory	No definite duration	No definite duration	No definite duration	No definite duration	No definite duration

—Aviation, 6 February, 1922.

**THE VACUUM AIRSHIP.**—Although the airship in this country is for the time being virtually dead, activity in connection with it is still being displayed in several foreign quarters. There are, of course, some here who even yet have not abandoned their faith in its future, but it cannot be denied that very little impetus now remains in this country behind the development of airships. They have been virtually discarded for naval and military purposes; those which we own have been the subjects of frequent mishaps, culminating in the lamentable disaster to *R-38*, and all efforts on the part of the Government to induce anyone to take over and operate the existing fleet on a commercial basis have failed. Abroad the discouraging factors have apparently been less acute or less acutely felt. Certain it is that here and there people are to be found who are laboring undauntedly to improve the design and construction of airships. In the United States, for example, full-sized experiments are being conducted by the Navy Department on the use of helium or a helium mixture as a substitute for hydrogen. But of all the efforts now being made none exceeds in scientific interest and fundamental significance those in connection with the Vaugéan airship at present in course of construction at Milan. This vessel, of which a description was published recently in *Le Génie Civil*, does not derive its buoyancy either from hydrogen or helium. Instead, M. Vaugéan seeks to secure flotation by exhausting the air from a metal sheathed envelope. Such a proposal is, of course, far from being new. Indeed, the use of rarified air as represented by Montgolfier's fire balloon of 1783 actually takes precedence of hydrogen or coal gas in point of time. It has, too, so far failed to yield practical results of any importance, and in modern times has been shown mathematically to be impossible of application to airships of the self-propelled type. M. Vaugéan holds, however, that the mathematicians' conclusions are premature, and that recent metallurgical discoveries combined with the adoption of certain principles of construction and working which he has devised, bring the proposal inside the reach of practical attainment.

The rock on which the vacuous balloon or airship has hitherto foundered is the difficulty or impossibility of constructing the envelope of sufficient size to give the required lift and of sufficient strength to resist the air pressure. A cubic foot of air weighs just over fourteen times as much as a cubic foot of hydrogen at the same temperature and pressure. It therefore follows that a given volume filled with hydrogen at atmospheric pressure is equivalent in lift to the same volume exhausted of air to a pressure very slightly in excess of one pound per square inch absolute. The outer skin of the equivalent vacuous airship or balloon is thus exposed at the ground level to a resultant pressure of 13.7 pounds per square inch, a figure small, of course, when contrasted with the pressure inside a boiler or outside a tube, but of prohibitive magnitude when applied to the exterior of a vessel of the size and construction of an airship or balloon. The essential characteristic of M. Vaugéan's scheme is that he does not propose to employ such a degree of rarefaction at the ground level. He designs his airship to travel, let us say, at an altitude of 10,000 feet. At that height the atmospheric pressure is about 10 pounds, so that with an internal vacuum of 1 pound absolute the envelope will be subjected to a resultant pressure of 9 pounds per square inch, a value which, he believes, he can design it to withstand. To descend he increases the internal pressure in such a way that when the ground level is reached it amounts to 5.7 pounds—that is to say, in such a way that the resultant pressure on the exterior of the envelope remains constant at 9 pounds throughout the descent. It is to be noted that were the internal pressure not increased and were the vessel pulled down to the ground level by means of ropes, it would arrive at the surface with

a considerable amount of surplus lift. By increasing the internal pressure in the manner stated the lift remains constantly equal to the weight of the structure throughout the descent. Such, in brief, is the essence of M. Vaugéan's scheme. As for practical details, it will perhaps be sufficient to say that it is proposed to use aluminum-copper-manganese alloys for the structure and sheathing of the envelope, to maintain and vary the internal vacuum by means of pumps assisted by the heat of the exhaust from the engines, and to carry the vacuum in three or more concentric chambers, each, passing inwards, containing a higher degree of rarefaction than the next outer one. By the judicious choice of the temperatures at which the contents of the three concentric chambers are preserved M. Vaugéan estimates that it will be possible to operate the vessel with an effective pressure of only 2.1 pounds per square inch on the outer skin, 3.5 pounds on the intermediate, and 4.5 pounds on the inner.

The scheme is doubtlessly open to criticism at several points. For instance, it appears certain that it is bound to result in an increase in the dimensions of an airship designed to give a specified lift. That such will be the case can readily be shown for the vacuous airship without concentric chambers. Taking the internal pressure at the ground level at the value previously mentioned—namely, 5.7 pounds—a simple calculation shows that to develop the same lift as a hydrogen airship the vacuous vessel would have to be 1.55 times as great. Such a magnification of the dimensions of a type of vessel already objectionably large cannot be regarded with approval, but it is not of itself a fatal disadvantage. From the practical rather than the theoretical point of view criticism of the scheme will no doubt be chiefly directed towards the difficulty of creating and maintaining a high degree of vacuum in a vessel the capacity of which may be anything from one to three million cubic feet. The effort required to maintain a good vacuum in a condenser is well known, but the two cases are, we think, hardly comparable, although we feel certain that this question of maintaining the vacuum will be quite the most difficult that M. Vaugéan will have to face. It should be remembered, however, that by carrying the vacuum in three or more concentric chambers differentially exhausted, not only is the crushing stress reduced, but the tendency to lose the vacuum by leakage is favorably modified. In addition, the arrangement will no doubt help the vessel in the matter of the size of the exhausting plant to be carried on board, for operational changes of the internal pressure would no doubt be effected in but one of the chambers, leaving the others under the pre-arranged vacuum. The whole scheme is very highly interesting. It may not be completely practicable at the present moment, but it might well become so with a little experience or, at the worst, as a result of some apparently small advance in metallurgy or in some other direction. It is at any rate worthy of scientific attention, for if it is or becomes practicable it will do very much more for the airship than would the discovery of a cheap, plentiful, and handy source of helium or other light non-inflammable gas.—*The Engineer*, 20 January, 1922.

## ENGINEERING

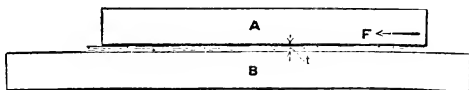
**LUBRICATION—ABSOLUTE VISCOSITY OF OIL.**—Everyone knows that some oils will flow out of a can more quickly than others, and that when rubbed between two fingers there is a difference in the feel—one oil will rub out more quickly than another. This difference in the action of lubricants is controlled by a basic physical property called viscosity.

Force is always required to change the shape of any body, on account of the resistance of its molecules to a change in position. In the case of the oil flowing out of the can, the force is that of gravity; when rubbing



the oil between the fingers, the force is the pressure applied by the fingers. Oils that have the greatest internal resistance are moved by gravity the most slowly; in other words, they flow out of the can less quickly.

This resistance of a fluid to a change in its shape is called viscosity. It is the inverse of fluidity. It is the property of the oil which enables it to hold two bearing surfaces apart, thereby preventing metallic contact and wear. Evidently, it is an important thing to know about an oil.



Frictional Resistance

There are, in common use, a number of units of viscosity, which should be thoroughly understood, the principal terms by which they are known being absolute viscosity, fluidity, specific viscosity, kinematic viscosity, Saybolt viscosity, Redwood viscosity, furol viscosity, Engler viscosity, and other units.

In the sketch a plate *A* is supported parallel to the plate *B* by the oil film of *t* thickness. In order to move the upper plate, a certain force *F* will be required to overcome the resistance of the oil film. The amount of this force *F* will be determined by the rate at which the plate is moved and the shearing resistance of the oil film. The faster it moves the greater will be the force required. If the velocity is kept constant and the thickness reduced, it will require more force to maintain the same velocity on account of the increased rate of shear of the thinner film. Obviously, also, the total force required varies directly with the area of the upper plate. Reducing all these facts to the form of a formula, we find that

$$\text{Force} = \frac{\text{shearing resistance} \times \text{area} \times \text{velocity}}{\text{film thickness}}$$

Since the shearing resistance is known as the *viscosity*, our formula becomes

$$\text{Force} = \frac{\text{viscosity} \times \text{area} \times \text{velocity}}{\text{film thickness}}$$

Under the conditions of a plate having a surface area of one square centimeter and a film thickness of one centimeter, when a force of one dyne is required to maintain a velocity of one centimeter per second, the fluid is said to have a viscosity of one *poise*. This unit, the poise, is the unit of absolute viscosity.

The force required to overcome the frictional resistance between any two moving surfaces separated by a film of lubricant may be calculated from the general formula,

$$F = \frac{\mu a v}{t}$$

When metric absolute units of measurement are used, *F* will be the force in dynes,  $\mu$  the absolute viscosity in poises, *a* the area in square centimeters, *v* the relative velocity in centimeters per second, and *t* the distance between the two surfaces in centimeters. When the English units of pounds force, square inches area, feet per second velocity, and inches thickness are used, the viscosity of course being measured in poises, as there is no English unit of viscosity, the formula becomes

$$F = \frac{\mu a v}{5737 t}$$

Fluidity is the inverse of absolute viscosity. An oil of an absolute viscosity of 0.25 poise will have a fluidity of 4. Oils of low viscosities have high fluidities, and very viscous oils have low fluidities.

The poise is a comparatively large unit, and as many oils at their working temperatures have a viscosity of less than one poise, another unit, the centipoise, has been brought into common use. The centipoise is one hundredth of the poise. An oil of an absolute viscosity of 0.25 poise has an absolute viscosity of 25 centipoises. Both terms are frequently used, although the latter is particularly advantageous as a unit of comparison, since the absolute viscosity of water at 20 degrees C. is almost exactly one centipoise, being 0.01005 poises.

Specific viscosity is the absolute viscosity of a fluid compared with the absolute viscosity of water at the same temperature. However, as the viscosity of water also changes with the temperature, common practice is to refer to the viscosity of water at 20 degrees C., at which temperature the absolute viscosity is 1.005 centipoises. On this account specific viscosity is a very convenient unit to use in visualizing the absolute viscosity of an oil, because everyone has a fairly good idea of the fluidity of water at 20 degrees C. (68 degrees F.). For instance, if we say the specific viscosity of an oil is 25, we know that it is twenty-five times as viscous as water at 20 degrees C., and will have twenty-five times the frictional resistance that the water has at that temperature.

Absolute viscosities are difficult to measure directly, except with the torsion viscosimeter, and on this account various instruments have been devised to measure units that have a relation to the absolute viscosity. These units are suitable for comparison within certain narrow limits and, if properly corrected for their variations, can be used to calculate the absolute viscosity of an oil. The principal trouble with the familiar viscosity units is that there is no constant multiplier or correction factor, nor do any of the various units have any direct relation between each other. Carefully worked out curves of calibration and conversion are usually necessary in order to obtain these relations.—*Power*, 28 February, 1921.

**TEST OF STILL ENGINE.**—The first large Still combined steam and oil engine was recently tested out by Scott's Shipbuilding Company. A higher thermal efficiency was obtained than that achieved by any other type of prime mover, as the fuel consumption proved to be only 0.375 pounds per b.h.p. hour at full load. This is equivalent to a brake thermal efficiency of 37.7 per cent.—*Nautical Gazette*, 18 February, 1922.

**NEW MARINE PROPULSION GEAR.**—In a paper read before the Institution of Engineers and Shipbuilders in Scotland, Mr. W. Ross Darling described a form of gear which he proposes for marine propulsion. The place of the teeth on the pinion is taken by a bundle of loose wire rollers which are free to move and adapt themselves to the form of the teeth on the gear wheel.

The pinions in use so far have proven entirely successful. They can be moved into gear instantaneously or gradually while revolving at any speed. This is done regularly at present at a speed of 2,000 revolutions per minute without shock or danger of any kind.—*Nautical Gazette*, 11 February, 1922.

**SAND BLASTING APPARATUS FOR CLEANING BOILERS.**—A new method of clearing boilers from scale and soot by means of sand blasting with compressed air has been introduced into the marine field by the Badische Maschinenfabrik of Durlach, Germany. This method has been already successfully applied to stationary boilers of the watertube and cylindrical

type, but its adaptability to boilers on board ships has only recently been demonstrated.

The apparatus consists of an air blower suitable for blasting sand through lances by means of a special kind of nozzle. The cleaned surfaces become so polished by the sand that they are given a metallic shine without damage to the boiler. The system may be applied to any kind of boiler provided with openings for introducing steam or air lances. In its operation the blower requires an air pressure of from 15 to 28 pounds per square inch and about 4,000 feet of non-compressed air per hour, during which time it will remove from 40 to 60 square feet of scale, while its performance in the removal of soot is much greater.

This method of cleaning boilers possesses several advantages over other systems. It works much faster, is more effective and more economical, and both the inside and outside of the boiler tubes can be cleaned. One of the main advantages of the system is the improvement in the heat economy of the boilers as a result of its use; the tubes of the boiler are cleaned so thoroughly that the heat is transferred more effectively than it would be if other systems of cleaning were used which inevitably leave a coating of scale and soot in and around the tubes.—*Nautical Gazette*, 18 February, 1922.

**DIESEL ENGINES FOR AIRCRAFT.**—Reports are in currency to the effect that research work which has been in progress at the Royal Aircraft Establishment at Farnborough is likely to lead to the development at an early date of a practical engine for aeroplanes which would be operated on the Diesel principle. It is said that in Germany a six-cylinder engine of this type for aircraft has been designed and built, and that French engineers are on the eve of achieving a similar success. From the point of view of aircraft operation the elimination of the magneto and carbureter and the possibility of using heavy oil with a high flash point is much more important than in other applications of engines designed on what, to the injustice of British workers, is commonly known as the Diesel principle. The reduction of the fire risk and the ability to use cheaper fuels than those now employed are most important considerations.—*The Engineer*, 27 January, 1922.

**ELECTROLYTIC PROTECTION OF BOILERS.**—According to W. Phillippi, in the October, 1921, issue of *Siemens Zeitschrift*, a successful method has been found to protect steam boilers against their two greatest enemies, corrosion and boiler scale. Careful investigations of corrosion on boiler bottoms, water tubes and condensers have proved that electrolytic action was the cause of these damages. Owing to the electromotive forces set up in the different metals used in the construction of boilers, condensers, etc., in connection with conducting water, currents circulated from these metals through the water and caused corrosion. But it was also found that in many cases stray currents from electric railways or from other poorly insulated electrical systems entered the boilers and caused corrosion.

A remedy suggested itself by employing a metal of higher voltage, like zinc, and connecting it electrically to the endangered boiler, to create a counter-voltage that would prevent the flow of the corrosive current. But this method did not always give complete satisfaction, as it was impossible to regulate the current, which is necessary for different conductivity of water used.

To use an externally generated direct current and to apply this through electrodes in the boiler, was found to be a remedy under all conditions. If this is done, the small but constant generation of hydrogen along the boiler walls will also prevent the formation of boiler

scale. A direct voltage of from 10 to 20 volts, at a current density of about two milliamperes per square foot boiler inner surface, was found to be most effective. A small resistance in series with each electrode circuit permits of suitable regulation of the current. Ordinary wrought-iron pipes are used as electrodes. Experience with this protection, extending over a period of several years, surpassed all expectations. On boats using sea water in the condensers, no corrosion of any kind was observed after months of operation, while it was necessary before installing the electrolytic protection to clean them every few weeks.—*Power*, 7 February, 1922.

### NAVIGATION AND RADIO

BRITISH CHARTS SUPREME.—Admiral Chandler, U. S. N., has paid a high tribute to the hydrographical work of the British Navy. This officer, who is the head of the Hydrographic Office of the American Navy, is quoted by *Lloyd's List* as stating that, according to the records of his department, there are 1,200 points on the globe to which ships of the U. S. Navy, as well as the merchant marine, necessarily navigate on British Admiralty charts, if navigation is to be accomplished at all. This means, says the *New York Commercial*, that the United States, though aspiring to a navy equal to any, and a merchant marine surpassing all has failed to chart the seas on its own behalf in about one third of the navigable globe. The omission of Congress to vote adequate appropriations is held responsible for this state of affairs. American battleships and merchantmen sailing in eastern Atlantic waters and along the west coast of Europe have to employ 712 different charts, of which number 539, or 75 per cent of the whole, are British Admiralty charts, made available during the recent war, in which the United States was associated with this country.

In his last appearance before Congress, Admiral Chandler told members of the Appropriations Committee that, granted sufficient funds, the United States might become independent of British charts within five years; but at the present rate, he added, such independence would never be reached. Of the 310 charts necessary for navigation round Australia and the East Indian Islands, 237, or 46 per cent, were available to American ships only through the courtesy of the British Admiralty. With the United States involved in a war which precluded the British Empire from lending such aid, an American battleship would have to await the completion of a chart if its duties called it to one of the many areas not yet charted by the U. S. Navy. Quite apart from the naval aspect of the of the hydrographical situation, continues the *New York paper*, which has its picture of American warships compelled, for lack of navigation charts, to await a month or two before giving battle, the development of the American merchant marine has resulted in most profitable activities for the British Admiralty chart agents in America. In addition to the large sums of money which the U. S. Navy has to spend each year on these charts, profits are pouring into the British Admiralty from the sale of similar charts to American shipping, 37 per cent of which goes regularly into European waters where Admiralty charts are the only ones to be depended on.—*Naval and Military Record*, 8 February, 1922.

NEW AEROPLANE COMPASS.—A satisfactory type of aeroplane compass has been invented by Doctors Paul R. Heyl and Lyman J. Briggs of the Bureau of Standards, of the Department of Commerce. Flying tests with this instrument have been made, and the air service is now engaged in putting a number of models into service.

The instrument weighs only 13 pounds, while the weight limit set by the air service was 25 pounds.

The new compass depends for its action not on a magnetic needle, but upon a revolving coiled wire. This principle is by no means new, but it has remained for the Bureau of Standards to apply it in such a way as to make the device practically operative under the very severe conditions prevailing in actual flight or aeroplane stunts.

The problem of perfecting a satisfactory aircraft compass was given the Bureau of Standards about a year ago. At the end of the war no completely satisfactory compass had been devised. Its importance to aviation is apparent when it is remembered that no aeroplane compass heretofore perfected has been able to keep up with the evolutions of a plane. Whenever the plane turned rapidly, or was stunted, compasses were not reliable. The result was that many pilots lost their lives by losing all idea of direction. Several of the air mail pilots have been killed because of the lack of a satisfactory compass. One of them crashed at full speed into a mountain in Pennsylvania.—*Aerial Age Weekly*, 13 February, 1922.

**NEW ROTARY BRAKE SOUNDING MACHINE.**—One of the latest developments in electrically driven appliances for marine service is the Lietz rotary brake sounding machine, which consists of a mechanical sounding device driven by a General Electric one-horsepower motor. By means of this apparatus soundings may be taken up to 100 fathoms without decreasing the speed of the vessel or incurring the risk of losing the lead or wire.

The outstanding feature of the machine, which is an improved type of a former design, is the brake action, which has been much simplified. The brake mechanism is of a new design, and consists of a mounted shaft having a hollow portion on which the reel revolves. The brake clutch is rigidly mounted and is operated through the hollow portion of the shaft by means of a screw. The screw, engaging with the rolling members in the hollow portion of the shaft, causes expansion and contraction of the brake clutch, which rotates with the reel and shaft while winding in.

The braking mechanism is actuated by a brake wheel on the outside of the casing and acts on the reel gradually, preventing its stopping suddenly with the consequent loss of the wire and lead. There is an indicator on the case near the brake wheel showing which way to turn it to free the reel and let out the wire, or to brake the reel for winding.

Although normally designed for operation by one-horsepower motor, the device is arranged so that it can be operated manually if desired. In this case, disconnecting the motor from the gearing is unnecessary, as the motor armature acts as a flywheel. The outfit is so constructed that all parts are easily accessible for inspection or repairs. It is so simple that it can be satisfactorily operated at night by inexperienced hands.—*Nautical Gazette*, 11 February, 1922.

**THE AMATEUR TRANSATLANTIC TESTS.**—Amateur operators sent radio messages from this country to Scotland during the recent test which were reported as strong and steady by the representative of the American Radio Relay League, which was in Scotland to receive the signals. The transmitting sets were limited to a rating of 1 kw. maximum and to a wave length of 200 meters. This in contrast with the commercial transmitters rated at 100 kw. to 1,000 kw., or over, using long wave lengths. According to reports received by the Radio Corporation of America, all of the successful senders employed vacuum tube transmitters. Nearly all the messages received in Scotland were sent from New England and New York State.—*Scientific American*, March, 1922.

**RADIO EQUIPMENT OF HUGE AIRPLANE.**—There has been installed on the huge Goliath biplanes engaged in the Paris-London aerial service a combined radio telephone and telegraph equipment of 35 watts antenna output, with a sending range of about 180 miles at 900 meters' wave length. The complete radio equipment, according to *Radioelectricite*, weighs only 125 pounds. An air-propeller-driven generator for six volts and 700 volts and a 6-volt storage battery supply the necessary current. A 3-bulb amplifier is used for receiving on all wave lengths between 300 meters and 1,000 meters.—*Scientific American*, March, 1922.

## ORDNANCE

**CATERPILLAR ORDNANCE.**—The United States Army is working toward the elimination of the horse and as a consequence three new types of motor equipment have recently appeared, sponsored by the Ordnance Department. These are a three-ton artillery tractor of unusual ability, a tractor mounting a 75-millimeter gun, and an eight-wheeled tractor carrying a 155-millimeter gun. At the present time only the 75-millimeter vehicle is waterproof, so that it can ford streams, but later on it is intended that all machines shall have this ability.

The three-ton artillery tractor was designed to take the place of the six-horse artillery team for hauling light artillery at speeds corresponding to the gallop of a horse. It has an unusual spring suspension and is particularly well adapted to ride through sand, marsh, and rough country without slackening speed.

The creeper belts are so sprung that they will follow the contour of uneven ground in much the same fashion that a snake does it. The lower side of the belt is forced into contact with the ground through the agency of four rollers, each pair of which is connected to one end of a cantilever spring. These springs are pivoted to the frame. Their other ends are linked to four rollers bearing against the upper side of the belt. This construction causes the lower side of the belt to follow the contour of the ground and at the same time keeps the belt taut regardless of the contour. It is interesting to compare this with the rope suspension described by Mr. Rowlinson for gaining the same end.

The problem of building a satisfactory self-propelled gun mount seems to have been pretty well solved by the type, which was developed by the Ordnance Department. One of the most serious difficulties has been that of keeping the weight down to a point where road bridges would carry the load. Another is the problem of wheel drive for roads and creeper drive for cross-country. Considering that the gun has a bore of somewhat more than five inches it is remarkable that the total weight of the vehicle is only 22 tons, the gun itself 6 tons.

It is propelled by a 120-horsepower six-cylinder engine, driving through a four-speed gearset. Wheels are driven through internal gears. When the track is removed the middle wheels are drawn up out of the way by a hand crank arrangement.—*Scientific American*, March, 1922.

**A NEW FRENCH GUN.**—Experiments with the new gun device, the invention of a French artillery officer, the feature of which is the high initial velocity of projectile which can be attained, are to be carried out at Liège. It is reported that in preliminary trials an initial velocity was attained with the famous French "75" of 850 m., whereas the normal figure is only 530 m. It is anticipated that in the Liège trials a velocity of 1,000 m. may be reached. Eminent artillerists are expected to be present at Liège next week, which has been provisionally fixed for the tests by the Belgian Government.—*The Engineer*, 27 January, 1922.

**ARMOUR-PIERCING SHELL.**—Little as the public hears about it, gunnery training in the post-war Navy is conducted on lines which leave nothing to be desired from the point of view of scientific thoroughness. The methods of 1916 have been revolutionized. The standard of accuracy at all practicable ranges is considerably higher now than then, and improvement is continuous. It is gratifying to know that if our battle fleet is ever again called upon to measure its strength against an adversary there will be no fear of its shooting prowess being stultified by defective ammunition. Our present projectiles are of the highest efficiency. Even before the end of the war a new and very effective type of A. P. shell had superseded the Jutland pattern, and since then this class of projectile has been developed to a wonderful pitch of perfection. Some instructive details appear in the latest issue of *Brassey*. Previous to the war our manufacturers received scarcely any official encouragement to persevere in their attempts to solve the problem of oblique attack. Although as early as 1913 one firm had produced a shell which would penetrate at angles up to 15 degrees, the Admiralty could not be induced to take it up.

Subsequent events overcame official conservatism, however, with the result that our latest projectiles have a good chance of holing thick armor plate even when the angle of impact is as much as 30 degrees. *Brassey* reproduces illustrations of shell which have actually performed this feat, and then been recovered intact and in a condition for bursting. It remarks that in 1920 the armor of most modern warships was perforable by contemporary projectiles at 30 degrees with velocities approximating to those which would remain with the projectile at battle ranges. While declining to prophesy as to the future, the same authority notes that our leading armament firms are prepared to construct guns of 18 inch and even 21 inch bore, and to provide A. P. projectiles of these calibers. Messrs. Hadfields have already built a 21 inch shell, which weighs  $2\frac{1}{2}$  tons, and if fired with a muzzle energy of 250,000 foot tons, would be capable of perforating 24 inches of hard-surfaced armor at a range of over ten miles. But, it is added, "the size of the vessel to carry such weapons is prohibitive, since facilities for docking and repair are barely adequate for the present-day leviathans. Moreover, with the menace of submarine and aircraft development, the direction of the evolution of the future battleship is still uncertain."—*Naval and Military Record*, 1 February, 1922.

### MISCELLANEOUS

**MEXICAN HARBOR DEVELOPMENTS.**—Harbor improvements costing approximately \$6,000,000 at the ports of Guaymas on the Gulf of California and Manzanillo on the Pacific Coast have been authorized by President Obregon of Mexico. Work at Manzanillo, which will entail an expenditure of \$5,000,000, is a resumption of the port development started in 1908 by Edgar K. Smoot, an American Engineer, but halted by the revolutions from 1910 to 1920.

At Guaymas, the most important of the Pacific Coast ports of Mexico, \$1,000,000 will be expended on a floating dry-dock, marine railway, and repair yards for ships. Although owned and operated by the Federal Government, the dry-dock, which will accommodate ships up to 5,000 tons, will be available for work on privately owned vessels.—*Nautical Gazette*, 25 February, 1922.

**SHACKLETON'S GRAVE.**—In deference to what, it is believed, would have been the dead explorer's own desire, Lady Shackleton has decided that Sir Ernest Shackleton's body shall not be brought home for burial as originally proposed, but taken from Montevideo, Uruguay, where it now lies, to South Georgia, and interred on the island.

Sir Ernest left no definite instructions as to his final resting-place, but his nearest relations and friends feel that it would be entirely in accordance with his desire that he should be laid to rest at the gate of the Antarctic and the scene of his greatest exploit. In 1916, after the loss of the *Endurance* in the Antarctic pack, Shackleton with two companions, made a voyage of 800 miles in a small open boat to South Georgia, reaching Grytviken in the last stages of exhaustion. Here he obtained help to rescue his comrades of the *Endurance* on Elephant Island, another desolate Antarctic island.

The site of Sir Ernest Shackleton's grave in South Georgia will probably be at the English church at Grytviken.—*Naval and Military Record*, 8 February, 1922.

AIRMEN BOMBARD MOORS.—Spanish aviators in Morocco have destroyed numerous native settlements of the Beni-Said tribe. This resulted in the chieftains sending a delegation to the Spanish military authorities pleading for a cessation in the bombardment and offering to submit to the Spaniards.

Aviators are preparing to bombard another center of concentration. In the course of the morning it was reported that a number of the most recalcitrant chieftains had gathered there with their followers.—*Aerial Age Weekly*, 13 February, 1922.

ICE BREAKERS AT TIENTSIN.—The Chinese Maritime Customs at Tientsin has made it possible for all steamers sailing to the northern port during the winter to go direct instead of around Zing Waung Tao to Tai Koo Kao, by installing ice-breakers. A toll is charged each steamer.—*Engineering*, 20 January, 1922.

#### CURRENT NAVAL AND PROFESSIONAL PAPERS

Naval Efficiency and Economy—*The Nineteenth Century*, February 1922.

Jutland and the Principles of War (Translated from "Revue Maritime")—*Journal of the Royal Institution*, February, 1922.

The Evasions of Washington—*Fortnightly Review*, February, 1922.

Fogs and Clouds—*Journal of the Franklin Institute*, February, 1922.

Methods of Air Navigation—*Aviation*, 27 February, 1922.

Notes on Ship-building Methods—*Engineering and Industrial Management*, 16 February, 1922.

Effects of Sulphur in Fuel Oil—*Power*, 10 January, 1922.

A Solution of the Principal Interior Ballistic Problem for Long Elliptic Cords—*Journal of the Royal Artillery*, February, 1922.

Electric Auxiliaries on the Merchant Ship—*The Marine Engineer and Naval Architect*, 16 February, 1922.

Radio for Everybody—*Scientific American*, March, 1922.

The World's Mercantile Shipping in 1921—*The Shipbuilder*, February, 1922.



# NOTES ON INTERNATIONAL AFFAIRS

FROM FEBRUARY 5 TO MARCH 5

PREPARED BY

ALLAN WESTCOTT, Professor, U. S. Naval Academy

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## UNITED STATES

**TREATIES SUBMITTED TO SENATE.**—Appearing in person before the Senate on February 10, President Harding submitted the seven treaties resulting from the Conference on Limitation of Armaments. The President's speech closed as follows:

Frankly, Senators, if nations may not safely agree to respect each other's rights and may not agree to confer if one party to the compact threatens trespass or may not agree to advise if one party to the pact is threatened by an outside power, then all concerted efforts to tranquilize the world and stabilize peace must be flung to the winds. Either these treaties must have your cordial sanction or every proclaimed desire to promote peace and prevent war becomes a hollow mockery.

Your Government encouraged and has signed the compact which it had much to do in fashioning. If to these understandings for peace, if to these advanced expressions of the conscience of leading powers, if to these concords to guard against conflict and lift the burdens of armament, if to all these the Senate will not advise consent, then it will be futile to try again.

**REPORTED OUT OF COMMITTEE.**—On February 25, the Senate Foreign Relations Committee reported favorably to the Senate all the treaties growing out of the Conference, with the exception of the two Chinese agreements. The only modification proposed was the Brandagee reservation attached to the Four Power Pacific Treaty. With this reservation the treaty was later ratified. The reservation follows:

The United States understands that under the statement in the preamble, or under the terms of this treaty, there is no commitment to armed force, no alliance, no obligation to join in any defense.

**YAP TREATY RATIFIED.**—By a vote of 67 to 22 the Senate approved without reservations the agreement with Japan relating to the island of Yap. There was an adverse vote on a proposed amendment providing that the United States should be sole judge whether or not the Japanese Government maintained radio communication on the island in accordance with treaty provisions.

## BRITISH AMERICAN OIL AGREEMENT.—

After several months of negotiations, British and American oil interests have reached a basis of agreement on their conflicting claims to the virgin oil fields in the five northern provinces of Persia—to which the Standard Oil Company of New Jersey received a concession several months ago—and will form a new joint British and American company for equal participation in the development of the fields. It is learned that only the details of the agreement await settlement.

Sir John Cadman, technical adviser to the Anglo-Persian Oil Company and chairman of the Inter-Allied Petroleum Commission during the war, returned to England a few days ago after representing his company in the prolonged negotiations over the claim to the undeveloped oil fields.

In these conferences, which have been going on since December, the Persian Government was represented by W. Morgan Shuster, fiscal agent in this country, and by Mirza Hussein Khan Alai, the Persian Minister. The Standard Oil Company of New Jersey was represented by A. C. Bedford, chairman of the board; E. J. Sadler of the directorate, and other officers of the company.

The five provinces covered by this contested concession are Mazanderan, Ghilan, Azerbaijan, Azrabad, and Khorassan, covering several hundred thousand square miles in the northern section of the country. The British company has been operating its oil fields in the southern part of the country for many years and a few years ago bought up the northern concession from a native of Georgia, whose claim, however, had not been ratified by the Persian Parliament. The Standard Oil's more recent concession was ratified by the Parliament. No company has undertaken development there.

"While Northern Persia is entirely wildcat territory, no wells having been drilled there, geologists who have examined the country say the northern provinces are underlaid by the same clear sand which is so prolific in Southern Persia," says *The National Petroleum News*. "Also, there are seepages of oil at various places in the northern provinces, so it is regarded as highly probable that oil resources as valuable as those in the southern part of the country will be developed in the north.

*New York Times*, 25 February, 1922.

## PLANS FOR EUROPEAN SETTLEMENT

PREMIERS MEET AT BOULOGNE.—On February 25, Premiers Lloyd George and Poincaré held a brief but very successful conference at Boulogne, clearing away many difficulties in Anglo-French relations. Among other things it was decided that there should be a conference of foreign ministers on the Near Eastern question at Paris during the second week in March, and at the same time another in London on plans for the economic conference at Genoa. Further decisions are given below.

ANGLO-FRENCH ALLIANCE.—After the Boulogne Conference Premier Lloyd George declared that the terms of the proposed Anglo-French Alliance were practically settled and that the agreement would be signed before the meeting at Genoa.

It is understood that the treaty of guarantee by which England pledges herself to come immediately to France's aid in case of unprovoked attack by Germany and to support France in enforcing German disarmament

will run for twenty years instead of ten, as originally proposed, and that there is in addition the important change that England and France pledge themselves to act in accord in case of trouble on the eastern frontier of Germany. This, of course, means that England and France promise to protect Poland against attack by Germany—a considerable victory gained by France for her protégé.

Doubling the term of the treaty naturally adds to its value for France. It now bears a strong resemblance to the proposed three-cornered agreement among France, England, and America which was never ratified, except that there is a time limit.

From the world-wide standpoint the alliance grows in importance from the circumstance that France and England cannot act together with regard to Germany without being in accord on other international questions affecting them. It is not to be expected that the two nations will be in perfect harmony on the Rhine and in discord at the Dardanelles. Conclusion of the alliance will justify the hope that the two big allies will at last find a common policy on reparations and in Asia Minor.

America has an interest in the Franco-British Alliance. It has been the case ever since the Paris Peace Conference that with England and France as rivals, America's entrance into world politics on a real scale meant that she would hold the balance of power. The close partnership between England and France changes that and puts us on a different footing.

It is not to be supposed that the new alliance will bring unmitigated joy to every Englishman or Frenchman who breathes the breath of life. Not at all. It is a partnership of many difficulties inherent from centuries of political rivalry. It is a partnership which has been decided upon as the next best thing to an association of the Allies and the United States to restore world stability. America made impossible the first choice of England and France. They now turn to the second-best choice.

*New York Times, 27 February, 1922.*

GENOA CONFERENCE POSTPONED.—At the Boulogne meeting the Entente Premiers agreed that the date of the Genoa Conference should be postponed until April 10, with the possibility of further postponement.

Early in February Premier Poincaré sent a note to Great Britain calling for a strict definition of the agenda of the proposed conference, insisting especially that each nation taking part should definitely accept the conditions laid down in the invitation; that there should be no attempt to alter the Versailles Treaty; that recognition of foreign rights and rights of private property on the part of the Soviet Government should precede recognition; and that the Genoa Conference should be postponed. The decisions on these points reached at Boulogne are summarized as follows:

As it stands the result is chiefly negative. The peace treaties signed in France are not to be brought into question. A revision of the Versailles Treaty and other treaties negotiated by the entente powers is thus ruled out, but the various treaties of Poland, the Baltic States, and Russia are not considered binding by those who did not participate in their negotiation. The reparations question is also not to be disturbed. It will be left to the reparations commission, probably after the meeting of finance ministers at Paris. The League of Nations will be associated with the Conference. This means that the disarmament question will

be left to the League. Experts will examine technical matters at London and the Genoa Conference is provisionally fixed for April 10.

Another negation is that participation of the Bolsheviki in the Conference will not imply immediate recognition of the Russian Government. It is understood that the Russian war debt will be set aside. Particularly would it be absurd to place the burden of the Koltchak and Denikin campaigns, which were financed by the western powers, to the account of Russia.

M. Poincaré obtained a definition of the engagement to abstain from aggression. It does not mean that coercion cannot be employed against Germany.

**SMALL STATES AT GENOA.**—In negotiations with Great Britain over the Genoa Conference, France made the proposal that Jugo-Slavia and other small states of Central Europe should be included in preliminary discussions. While England did not consent to this suggestion, it is evident that the smaller states will play an influential part in any general economic settlement at Genoa. Tzecho-Slovakia, under the strong leadership of President Masaryk and Foreign Minister Benesh, is supported not only by the "Little Entente" alliance with Rumania and Jugo-Slavia, but also by the Polish-Tzech accord of November, 1921, and the recent Austro-Tzech economic treaty. Furthermore, the proposed conference on March 12 of the foreign ministers of Poland, Latvia, Esthonia, and Finland may bring the Baltic States into this combination to promote the common interests of the small powers. Only Hungary and Lithuania are excluded.

Such a combination, however, is likely to serve its own interests primarily, rather than those of France or the Western Powers. Nor can it lead to a general Danube Confederation, in view of the exclusion of Hungary, and its fundamental purpose of mutual defense against Magyars, Germans, and Russians.

**REPARATIONS AGREEMENT.**—At the Boulogne Conference it was agreed that the question of German reparation payments should be referred back to the Reparations Commission. On February 28, the Commission reached an agreement with Germany, subject to ratification by the powers concerned, in accordance with which Germany will pay this year a total of 720,000,000 gold marks in cash and 1,450,000,000 gold marks in kind.

While this arrangement was not accepted with enthusiasm in Germany, the Government on February 15 nevertheless secured in the Reichstag an open victory over the Junker opposition led by Hugo Stinnes. On that date the Reichstag by a vote of 230 to 185 upheld the Government in its firm measures for suppression of the general strike.

#### LIMITATION OF ARMAMENTS

**PLANS FOR TEN YEAR TRUCE.**—Prior to the Boulogne Conference, the European press announced that Premier Lloyd George had "a great plan"

for a ten-year truce throughout Europe, based on an agreement of European nations to respect each other's frontiers, abstain from aggression, reduce land armaments, and devote themselves to economic reconstruction. What resulted at Boulogne was apparently a decision to leave the question of reduction of land armaments to the machinery of the League of Nations.

The League of Nations Commission on Disarmament met in Paris during the third week of February. It was decided that the commission should continue work on a schedule of military requirements of league members for defense and colonial needs, should meet again on July 15, and then prepare draft proposals for land disarmament to be submitted to the League Assembly in September.

It was decided that the best method of approaching the question of national control of the manufacture of arms and munitions would be to suggest to league members ratification of the Convention of St. Germain on this subject. The questions of noxious gases in warfare and revision of international law were left to await detailed reports of the work done at the Washington Conference.

OPENING OF WORLD COURT.—The formal opening of the Permanent Court of International Justice at the Peace Palace in The Hague on February 15 was attended by Queen Wilhelmina and a large assemblage of diplomats. Dr. Gaston da Cunha, the only representative of the Council of the League of Nations present, pointed out that, whereas all previous efforts to establish such a court had failed, the existence of the League had made it possible. Dr. B. C. T. Loder, president of the Court, spoke of the appropriateness of Holland as the seat for the court, in view of its past history and devotion to international law.

#### GREAT BRITAIN AND IRELAND

IRISH ELECTION POSTPONED.—At a meeting of the Ard Fheis, or Sinn Fein National Convention, on February 21, a compromise was reached between the factions for and against the Anglo-Irish Agreement, providing:

(1) That the Convention should adjourn for three months and that no elections should be held in the meantime.

(2) That the Dail Eireann should continue to meet regularly in the interval, but that no division should be regarded as a party vote requiring the resignation of the Provisional Government.

(3) That when an election was held, both the Anglo-Irish Agreement and the Constitution for the Irish Free State should be presented to the voters at the same time for their approval.

This compromise in some degree jeopardized the Agreement, since it put the drawing up of the Constitution into the hands of the Sinn Fein, and gave opportunity to opponents of the Agreement to organize their attack. A vote in the Dail on February 28 gave the Collins-Griffith party the narrow majority of 56 to 50.

Following the Irish decision to delay ratification, Irish and English Cabinet members held a conference in London on February 26. It was decided that, in spite of the delay, the British Government should proceed with consideration of the Agreement in the House of Commons. Efforts were made and defeated in House committees to amend Article XII of the Agreement, relating to boundaries, so as to protect Ulster. Article XII provides that a commission of three members, one each for North and South Ireland and one appointed by the British Government, shall settle the boundary "according to the wishes of the inhabitants . . . so far as may be compatible with economic and geographic conditions." Mr. Winston Churchill declared that any attempt further to define or limit the scope of the commission would be certain to defeat the Agreement.

**RIFTS IN COALITION GOVERNMENT.**—Weakening of the Liberal-Unionist coalition which has so long supported the Lloyd George Government was emphasized during the first week of March by a letter from Premier Lloyd George to Unionist members of his Cabinet declaring his intention to resign unless he could be assured of unwavering support from the Unionist Party. "Die-Hards" in this party, led by Sir George Younger as head of the party organization, had opposed the Government's Irish policy and in general shown a tendency to break away from Lloyd George's leadership. On the other hand, the Premier by his letter indicated an inclination toward the creation of a new "center" party recruited from both Liberals and Conservatives and standing between extreme Tories and Radicals.

On March 4 Mr. Austin Chamberlain asserted the loyalty of Unionist cabinet members to the Premier so long as he was willing to lead the coalition.

**STRONGER POLICY IN INDIA.**—Speaking in Parliament on the situation in India, Premier Lloyd George explained the state of unrest there as a result of the spread of western liberal ideas throughout the East, in China as well as India, and declared that the practical application of these ideas would, as in China, "shatter the country into warring fragments." The present agitation in India is partly explained also by Mohammedan chagrin at the overthrow of Turkish power in the Near East. Establishment of Egyptian independence will in some measure satisfy Mohammedan interests, but is sure to be followed by similar demands for India.

In the meantime the Indian Nationalist Party decided in February to suspend temporarily their policy of civil disobedience.

**MEASURES FOR EGYPTIAN INDEPENDENCE.**—After waiting in vain for the establishment of a responsible ministry in Egypt, the British Government on February 28 issued a unilateral statement again declaring the basis

on which it was prepared to grant Egyptian independence. These terms were practically the same as in previous declarations:

First—Security of the communications of the British Empire in Egypt.

Second—Defense of Egypt against all foreign aggression or interference, direct or indirect.

Third—Protection of the foreign interests of Egypt and protection of minorities.

Fourth—We are prepared to make an agreement with the Egyptian Government in a spirit of mutual accommodation whenever a favorable opportunity arises for the conclusion of such an agreement. But until such an agreement satisfactory to ourselves and to the Egyptian Government has been concluded, the *status quo* will remain intact.

In his speech in Parliament Premier Lloyd George added that "foreign powers are not concerned, and we propose to state this unmistakably when the termination of the protectorate is notified by us."

On March 1 a new government was established in Egypt under the moderate Nationalist leader, Abdil Khalek Pasha, with the purpose of at once renewing negotiations for ending the protectorate.

## ITALY AND SOUTHERN EUROPE

FACTA HEADS ITALIAN CABINET.—After a brief effort to carry on the Italian Government with a reorganized cabinet Premier Bonomi finally resigned on February 18. His successor was Luigi Facta, a former follower of Giolitti, who entered office on February 25 with a cabinet drawn from all constitutional groups except the Nationalists and Fascisti. While Facta is himself a Liberal, the Catholic party is even more predominant in this cabinet than in the one preceding.

FASCISTI CAPTURE FIUME.—On March 3, a band of Italian Fascisti temporarily gained control in Fiume by attacking the government headquarters with cannon and forcing the surrender of President Zanelli, head of the Fiume Free State. Hostilities between Croat and Italian factions in the city were renewed. An Italian cabinet member was sent to investigate the situation, in view of its threat to the friendly relations between Italy and Jugoslavia established by the Treaty of Rapallo.

POPE PIUS CROWNED.—Cardinal Ratti upon his election to the papacy took the name Pius XI, and on February 1 was crowned in St. Peter's as the two hundred sixty-first Pope.

KING STRENGTHENED IN SPANISH CRISIS.—A cabinet crisis in Spain was brought about at the close of January by the action of the War Minister in removing high military officers for public criticism of the conduct of military affairs. Upon the threat of the military juntas to eject the War Minister unless he resigned within forty-eight hours, the Cabinet appealed

to the King and later presented their resignations. The crisis ended with the restoration of the Cabinet, a strengthening of the King's prestige, and a blow at the power of the army juntas in Spanish politics.

### NEAR EAST

FRENCH SUPPORT OF YOUNG TURKS.—Correspondence between the British and the French Governments over the Near Eastern question was published in the middle of February in a British White Paper. In this correspondence the British took the ground that the Angora Agreement constituted a direct violation of France's obligations to her allies by practically recognizing the Angora Government as sovereign in Turkey, and by surrendering to that Government territory which had been conquered by British troops and turned over to France only as a mandatory power under the supervision of the League of Nations. The French denied that the agreement constituted a recognition of the Nationalists, and conceded in principle that all agreements relating to Turkey should be subject to readjustment in a final settlement.

In the absence of Allied agreement upon a common policy in the Near East, it appeared probable that the Greek Government would evacuate Anatolia in the spring rather than face a renewed Turkish offensive backed by the support of France and Russia. A mission from the Angora Government to the Western powers left Constantinople on February 28, with a schedule of demands calling for almost complete restoration of Turkish control in Thrace and Asia Minor, including Allied evacuation of Constantinople and the Straits.



## REVIEW OF BOOKS

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SHIP NAMES OF THE UNITED STATES NAVY, THEIR MEANING AND ORIGIN, by Robert W. Neeser; Moffat, Yard & Co., 30 Union Square, New York City.

Many a name borne by our vessels of war means nothing even to those reasonably familiar with our naval history, and Mr. Neeser has done a welcome work in setting down the traditions that these names perpetuate. The department has already taken the lead in this matter by setting up on each ship a name-plate containing the most important facts, but this book offers much more. Indeed, it includes ships no longer in existence and those which, on account of our naval reduction, never will exist.

There are, however, a number of seeming inaccuracies in fact and implication that might be cleared up in another edition. Mr. Neeser says that Columbus was born in Corsica. This is interesting, if true, but the encyclopedias still give Genoa. Beale is reported as having graduated from the Naval Academy in 1842, which is three years before the Academy was founded. Henley is described as the officer who "led Commodore Macdonough's squadron into action at the battle of Lake Champlain," but nobody led it into action because it was moored in line and merely awaited the attack of the British, who "led into action." Again, Blakely is spoken of as the man who "commanded the brig *Enterprise* in the second year of the war of 1812." This statement needs qualification because it was Burrows who commanded her in the famous action with the *Boxer* in September, 1913, after Blakely left her for the *Wasp*. It seems a curious omission, too, that in giving Buchanan's record the author should have left out the fact that he commanded the *Tennessee* when she engaged, single-handed, Farragut's entire fleet in Mobile Bay.

It is to be regretted that Mr. Neeser could not find room for a brief summary of the facts that have made a ship famous. These facts are far more significant for this volume than the history of a particular state or tribe of Indians that has given its name to a ship. And while in some cases he make the statement that so-and-so is the third ship to bear the name in our navy, in others he leaves the matter hanging by saying, "the first ship to bear this name was . . ." or "this ship name commemorates . . ." etc. This is true of the *Serapis*, the *Insurgent*, the *Java*, and other prizes. Now the original *Java*; for instance, was blown up immediately after the action; was there another *Java* in our Navy, and when? The book ought to give these facts.

Mr. Neeser's explanation of the origin of these ship names arouses question in some cases as to their fitness. Why should so many politicians who happened to be Secretary of the Navy have their names perpetuated on destroyers, especially the kind of Secretary that regarded the Navy as merely a grab-bag for his party? Some, perhaps, deserve to be remembered in the same company with Decatur, Hull, Perry, and Farragut, but they are few. And why should Maury and Mahan, the two men of the American Navy best known throughout the world, be assigned to light mine-layers, while somebody who happened to be washed overboard or killed in an accident on shore is immortalized by a destroyer? Doubtless whoever was responsible had reasons for the selection of every name, but they are not always apparent from Mr. Neeser's work.

W. O. S.

KEEP THE INSTITUTE INFORMED OF YOUR  
ADDRESS

It is earnestly requested that members send in their correct addresses whenever they make a change; for unless they do, we shall be unable to guarantee prompt delivery of their PROCEEDINGS, as issued.

SECRETARY AND TREASURER.

## NOTICE TO MEMBERS

More members, both regular and associate, are desired. Any increase in membership invariably means a larger number of articles submitted, and consequently an improvement in the PROCEEDINGS.

You are requested to send or give the attached slip to someone eligible for membership, urging him to join.  
By direction of the Board of Control.

-----  
Attention is invited to extracts from the constitution on the opposite page as to the requirements in making applications for life, regular and associate membership.

*To the Secretary and Treasurer,*

*U. S. Naval Institute,  
Annapolis, Md.*

*Dear Sir:*

*Please enroll my name as a*  $\left\{ \begin{array}{l} \text{regular} \\ \text{associate} \end{array} \right\}$  *member of the U. S. Naval Institute from*-----

*Very truly yours,*

-----  
Members are liable for the payment of the annual dues until the date of the receipt of their resignation in writing. Annual dues \$3.00.  
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-----1922.

## NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-ninth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

### ARTICLE VII

Sec. 1. The Institute shall consist of regular life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nomination shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life

membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

## ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, \$3.50; enlisted men, U. S. Navy, \$3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

## SPECIAL NOTICE

### NAVAL INSTITUTE PRIZE, 1923

A prize of two hundred dollars, with a gold medal and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the following pages are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1922 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1922. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1922 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and a number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

F. M. ROBINSON,

*Lieut. Commander, U. S. Navy, Secretary and Treasurer.*



## TOPICS FOR ARTICLES

### SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

The Naval Policy of the United States.  
The Navy: Its Past, Present and Future.  
The Fighting Fleet of the Future.  
Factors Governing American Naval Strength, Absolute and Relative.  
The Navy in Battle; Operations of Air, Surface and Underwater Craft.  
Escort and Defense of Oversea Military Expeditions.  
The Place of Mines in Future Naval Warfare and the Rules Which Should Govern Their Use.  
The Relation of Naval Communication to Naval Strategy.  
The Influence of Topography on Strategy.  
International Law.  
Principles on Which Should be Founded the Freedom of Neutral Shipping on the High Seas.  
The Present Rule of Neutrality Regarding Contraband and Blockade—Is It Justifiable in Ethics or in Expediency?  
What Will be the Status of the Submarine in International Law?  
Aircraft—Its Place in Naval Warfare.  
Aircraft, Practical Power of.  
Aircraft Warfare, Laws of.  
Aviation—Its Present Status and its Probable Influence on Strategy and Tactics.  
The Control of the Sea from Above.  
The Navy Air Service, Its Possibilities, Rôle and Future Development.  
The Anti-Aircraft Problem from the Navy's Viewpoint.  
Surface Craft, Future Rôle of.  
Armor or High Speed for Large Surface Vessels.  
Naval Gunnery of To-day, the Problems of Long Range and Indirect Fire.  
Mode of Design and Armament of Ships to Meet the New Conditions of Aerial and Sub-Surface Attack.  
Future Development of the Naval Shore Establishment.  
Naval Bases, Their Number, Location and Equipment.  
Strategic Requirements of the Pearl Harbor Naval Station.  
The Navy Yard as an Industrial Establishment.  
A Mobilization Program for the Future.  
Naval Organization from the Viewpoint of Liaison in Peace and War Between the Navy and the Nation.  
Organization of a Naval Communication Service.  
Scope of Naval Industry Activity and the Navy's Relation of Naval Strength.  
Social and Industrial Conditions in Relation to the Development of Naval Strength.  
The Future of the Naval Officers' Profession.  
The Naval Officer and the Civilian.  
The Naval Officer as a Diplomat.  
The Mission of the Naval Academy in the Molding of Character.  
The Limits of Specialization in Naval Training.  
The Training of Communication Officers.  
Navy Spirit—Its Value to the Service and to the Country.

Morale Building.

Military Character.

Amalgamation of the Supply Corps, Construction Corps and Civil Engineering Corps with the Line of the Navy.

The Influence of the Term of Enlistment on the Efficiency of the Service.

Shore Duty for Enlisted Men.

Physical Factors in Efficiency.

Health of Personnel in Relation to Morale.

America as a Maritime Nation.

Our New Merchant Marine.

The Adaptability of Oil Engines to all Classes of War Vessels.

# United States Naval Institute

## Proceedings

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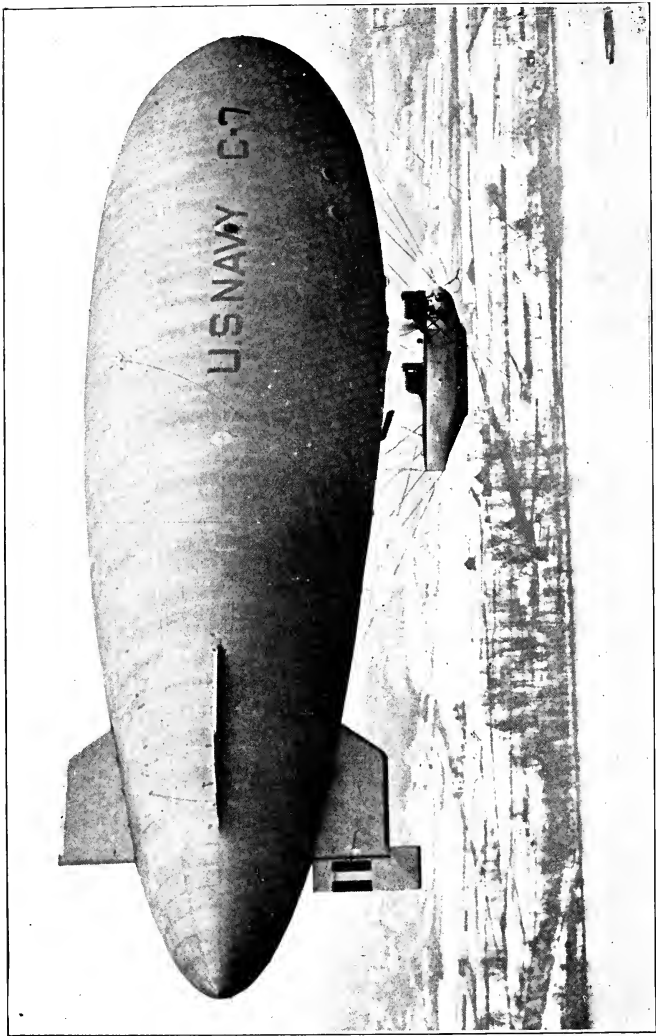
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THE C-7 IN FLIGHT OVER THE POTOMAC RIVER ON DECEMBER 5, 1921, DEMONSTRATING THE COMPLETE PRACTICABILITY OF  
HELIUM AS A LIFTING MEDIUM FOR AIRSHIPS



# UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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## THE WHYS AND WHEREFORES OF AIRSHIPS

BY CLIFFORD ALBION TINKER

*Formerly of the Bureau of Aeronautics, Navy Department*

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Airships: How are they navigated, how are they landed, how are they anchored, how many men in their crew, are they safe, and what good are they anyway? These questions are timely, pertinent, and frequently asked; their answers are not difficult, nor do they involve technical jargon incomprehensible to the non-scientific. Aeronautics, like all human activities, is ninety per cent common sense; highly mysterious and obscure theories have little to do with practical aviation.

Navigating an airship, while a common-sense proposition, involving good sound navigational principles, depends, however, on a knowledge of factors not present in surface-ship navigation. The air as a navigating medium has certain characteristics common to the ocean, but in addition, it offers meteorological handicaps which go far beyond any difficulties that ocean traffic has to contend with. The navigator of an airship is the busiest little navigator that one could imagine. He is one nerve-center coöperating with other nerve-centers which go to make up the officers and crew of an airship.

Machinery is never quite fool-proof and the human element must always be reckoned with. Automatic machinery, up to a certain point, can be relied upon; after that, thinking man with trained intelligence completes the cycle. An airship's crew, while not necessarily supermen, must be trained and skilled, and resourceful beyond mere machine operators or balloonists; a mental "dud" has no place on such craft.

To navigate an airship under way, one is concerned with problems involving three dimensions. Like a surface ship, she has to be steered horizontally to cover the shortest course possible from port to port. In addition, however, she must be navigated at varying heights above the land or sea to enable her to take advantage of changing atmospheric conditions or to pass over high mountains, fog, local storms, or other impediments. There is complexity here which calls for skill.

Vertical rudders control an airship in steering on a horizontal course in exactly the same way that one steers a surface vessel; but in height steering, problems are involved which do not interest the surface craft navigator. The airship is enabled to ascend on an even keel by discharging ballast, and to descend by discharging gas. She can be kept on a level course or inclined up or down by her elevator planes, and so may climb or descend by using the thrust of the air on the top or bottom of her hull. When a height is reached, however, where the dynamic lift imparted by the motors and the air thrust just balances the reduction of gas lift due to the gain of altitude, the ship ceases to ascend, the action of her elevator planes becomes neutral, she must discharge ballast to climb farther. Likewise, by use of the elevator planes, she can be forced downwards until the thrust equals the gain of lift when gas must be discharged if lower altitude is the object.

Large rigid airships require two steersmen, one who operates the rudder wheel and holds the ship on the designated compass course, while the other keeps the ship at the proper altitude by operating the elevator planes and by regulating the discharge of gas and ballast.

Surface-craft navigators are supplied with fairly complete data for all their calculations, and ocean navigation is really a matter of well-understood routine. On the charts the speed of the ship

and the directions of the various ocean currents, both of which are constant, are pricked off. Even dead reckoning methods by the patent log come within close enough limits for all practical purposes in the open sea, while the accurate standardization of propellers plus astronomical observations, which are nearly always obtainable, place surface navigation as one of the simple arts. This is not quite so in the case of the airship. Her course and distance made good are the result of her own speed and the speed and direction of the air currents in which she is carried along. Sometimes these air currents are of tremendous velocity.

One can readily see how the airship navigator cannot plot a course by dead reckoning unless he knows the speed and exact direction of the air movement. When an airship is flying over the land, if visibility permits, oftentimes the navigator can determine the air drift by taking observations on fixed points on the surface, and can thus adjust his compass course to enable the ship to maintain the necessary true course. Airship navigators over the North Sea during the World War, when at comparatively low altitudes, figured out their air drift by noting the direction of the waves, a fairly accurate method.

When an airship is caught in a fog or thick haze, a dense storm, or even heavy cloud formations, either over the land or the sea, astronomical observations are impossible, the computation of air drift is out of the question, and in such a case an airship may be driven many miles off her course. Such a contingency, however, is minimized by the use of directional radio apparatus on the airship used in conjunction with ground stations just the same as the radio compass stations along the coast give ships at sea their position and lead them along by continued bearings to port and safety.

Rather a formidable list of navigational instruments is required on an airship. In addition to the magnetic steering compass, there is supplied a prismatic compass which is used in taking bearings of known points on the surface of the earth to determine the ship's position, and a drift indicator, which shows the amount of leeway that the airship is making. Other instruments are: an inclinometer, which shows whether or not the ship is in a horizontal position; an aneroid barometer, for measuring approximate heights of the ship; a statoscope, which indicates the air

pressure, whether it be increasing or decreasing, which tells the navigator whether the ship is falling or rising; and a barograph, which is a recording barometer, the ink line which it traces on a chart being used in calculating the rate of ascent.

The foregoing instruments are all used by the directional and height steersmen, while the navigator himself, in addition to the steersmen's instruments, is supplied with a standard chronometer, giving Greenwich time; and a "trip clock" which is always set at zero at the beginning of the flight, thus furnishing a "time-elapsed" record. The air pressure due to the velocity of the ship, and which has a constant relation to the speed, is measured by a Pitot tube and indicator, while a propeller speed indicator mounted in the air stream is calibrated to give revolutions in terms of air speed. This speed indicator works on practically the same principles as the patent log used by surface mariners.

In the thermometer line the navigator is well supplied. Wet and dry thermometers give the temperature and humidity of the atmosphere, and a thermo-couple gas thermometer operating an indicator gives the temperature of the gas in the gas bags. The readings from these three thermometers applied together serve to calculate the lifting power of the airship under changing atmospheric conditions.

Airships, when not cruising, are either housed in sheds, moored to the ground, anchored over the water, or swinging from mooring masts. The method of landing, mooring, and getting underway, depends upon which one of the above situations confronts the crew.

By all odds, the easiest and most economical means of mooring an airship is the mooring mast. The most expensive and difficult problem of handling an airship is on the ground in connection with hangars and airdromes. Unless the hangar and airdrome are used as a terminal and for repair and up-keep purposes, the expense is enormous; but, inasmuch as terminal hangars are combined with manufacture, overhaul, up-keep and repair, a large force of mechanics and ground men is always available for handling the aircraft, thus reducing the immediate cost of operation. From 300 to 400 men are necessary to handle a large airship on the ground and to "walk" her in and out of a hangar. On the other hand, ten men can handle the biggest airship when making fast or uncoupling from a mooring mast.

The difficulty of handling airships on the ground is due to the possibility of sudden changes of wind, making it a problem to land and enter or leave a shed without damage. The method employed in housing an airship on the ground consists of bringing the ship up to the shed stern first, with the bow to windward of the doors, if a cross wind is blowing. The ship is then "walked" into the hangar by men having hold of her guy ropes, the bow being allowed to drift toward the center line as the stern of the ship is pushed into the building. If the wind is blowing directly in and out of the hangar, it is not necessary to hold the bow to windward, the ship being walked straight in.

The handicap of shifting and variable winds is overcome, to an extent, by the use of wind shields built on either side of the hangar entrance, and, in some instances, the doors are so arranged that they act as wind shields. The mechanical handling of airships in and out of hangars has not been developed to any great extent, although in England and Germany, trolleys running on rails in and out of the sheds have been used, a method which simplifies the operation of housing and reduces the personnel required.

Mooring over the land, aside from the use of mooring masts, is accomplished by wire cables, usually three in number, which are passed through bollards or posts, sunk into the ground at the apices of an equilateral triangle, the cables being then spliced into a mooring swivel at the point of mooring. The mooring swivel is attached to a floating ring on the ground, which moves about to accommodate the pitching and tug of the ship. When airships are moored in this manner, ballasting and gassing, to counteract super-heating and sudden changes in the weather, have to be arranged for on the ground and carried up to the ship by means of a pilot balloon.

When mooring over the sea, an airship drops a sea anchor, or "drogue," formed of a large canvas bucket which fills itself with from two to four tons of water, exerting a drag on the ship's movements and keeping her bow to the wind. The "drogue" is then picked up by surface craft and the airship towed where required or allowed to ride from a mooring rope made fast to the surface ship.

The mooring mast has increased the possibility of commercial use of airships tremendously and reduced the expense of operation

materially. The mast consists of a latticed steel structure from 150 to 225 feet high, preferably not less than one-quarter the length of the airship to be moored, and having at the top a swivel arrangement which allows free movement of the airship as she surges and swings in the wind. An elevator is installed in the mast for the accommodation of passengers, freight, and express matter, the passengers walking across a platform from the swivel structure into the ship, thence down the runway to the cabins. Pipes for the supply of gas, fuel, and water ballast extend up the mast and are coupled to the intake pipes and valves on the ship.

In England, mooring masts have been tested out for long periods, proving to be safe for ships even in winds up to ninety miles an hour, and ships have been moored and unmoored in winds up to fifty miles an hour without difficulty.

Mooring an airship to a mooring mast is simplicity itself. As the airship, en route to the airport, radios in her time of arrival, preparations at the mast are quickly made. A mooring cable of steel leads from a steam or electric winch at the base of the mast, up the center, through the revolving circular cone and down to the ground again, and is then led out about 600 feet from the mast in the direction of the approaching ship. Two men stand by the end of the cable to make it fast to the ship's cable, one man stands by the winch, and two at the top of the mast to manipulate the anchoring gear.

The ship approaches at an altitude of about 500 feet and reels out her mooring cable in a loop, and when over the end of the cable on the ground, lets go the outboard end of the mooring cable. The two cables are joined and the ship, on signal from the men standing by, rises to an altitude of about 1,200 feet, discharging ballast until she is about two tons light and trimmed down by the stern. The cable is then reeled in at a signal from the ship to haul down.

When she is within about 500 feet of the top of the mast, two other cables about 600 feet long, leading from her mooring stands, are let down. These cables are secured to surging cables, led from the ground into the forward hatch of the ship, and a steady tension is kept on all cables until a cone on the ship's bow slips into an inverted cone on the mast. A cable from a

small winch is then hitched on the mooring cable and the gear pulled down until taken up on the mooring collars at the head of the mast. This securely moors the ship. The surging and holding-down cables are then disconnected and hauled into the ship.

To release the ship, a pendant is let down through the revolving cylinder and tension put on it by means of a hand reel until the locking springs on the cones are free of pressure and can be pulled out. All the engines are started and the after-motor is thrown in gear and speeded up to offset the air speed. With engines backing at the moment when all is ready for letting go, the cone springs are pulled out and the ship rises.

An airship moored to a mast has to be kept trimmed down by the stern at all times when landing, riding at the mast, or getting away. Otherwise, the wind, hitting the nose of the ship, throws the stern up and the ship surges about very badly.

The duties of the crew of an airship in maintaining the ship in commission, in overhauling and repairing the ship and its motors, and "preparing ship for flight" involve duties which might be called "stunts"—they are so entirely different from the procedure on any other kind of craft in existence. Even Jupiter, Neptune, and the gods of the four winds would pop their eyes out at the turning of levers, the sounding of gongs, the shining along trusses, and wandering around among gas bags, fuel tanks, ballast tanks, and cabins which the crew are obliged to do every day while the airship is inflated.

The first thing in the daily routine is taking the "lift and trim." This is nothing less than calculating the total lift of the airship by summing up the amount of ballast; meaning water, gasoline, oil and other necessities on board the ship, and noting the result on a special chart. By doing this a daily lift record of the ship is kept, and from this record may be noted how much the lift varies from day to day, for if one day's lift is less than that of the foregoing, and no gas has been valved, it is plainly apparent that a loss has occurred, and immediately the gas bags are inspected for leaks.

By recording the location of ballast on board, the "trim," which means the tendency for lightness or heaviness in one end of the ship or the other, can be noted and compensated for if

necessary. It is highly desirable to keep weights distributed evenly along the length of the ship, otherwise undue stresses may spring the hull structure.

Lift and trim being taken, the crew is sent to the cleaning stations throughout the ship. Not only is the ship itself cleaned and thoroughly polished, but the engineers overhaul and condition the engines and cars, the riggers inspect the controls, gas bags, valves, the outer covering, the fin surfaces, and do any necessary upkeep work to maintain the ship in a top-notch condition.

The framework of an airship, being of duralumin, is extremely light, and in climbing around on the girders of the hull structure there is more or less breakage of small braces and wires, making it necessary for almost constant hull inspection and repair work to be going on. Then again the outer cover fabric may get torn and blown loose at the joints, and when this happens repairs must be made immediately. Otherwise, the small holes would develop into big rents and result in the stripping of large sections of the envelope. The gas bags being very thin and light require a deal of attention. Chafage results in leaks and the consequent loss of gas, lowering its purity and reducing its lift.

Leak detectors are used for inspecting the gas bags. These detectors are applied to the outside of the goldbeater skin covering and register any traces of gas going through them. The leak detector being only twelve inches in diameter, and the surface of the balloonets or bags being tremendous, this leak inspection is a tedious process. Balloonets found to be unusually porous, causing rapid gas leaking and loss of purity, are at once replaced. The bags which are taken out are air inflated, inspected, and repaired where possible. When station equipment is inadequate for this work the bags are sent to the factory for repair. Every week each bag is tested for gas purity which serves as a check on the general condition of the gas tightness of each balloonet, and the ship as a whole.

Other routine work which claims the attention of the crew consists of checking the tension of various wires, correcting any discrepancies, tautening the outer cover, cleaning and reseating water ballast discharge valves, and general inspection of all the controls to see if they are functioning properly. These general inspections are carried out weekly, or oftener if an airship is in constant use.



Preparing an airship for flight is a very active operation. A great many things are going on at one and the same time. The first thing to know is how large a crew is going to be carried, how much freight and the number of passengers, the nature of the flight, and its probable duration. With these factors known, calculations are made which give the amount of gas needed for the necessary additional lift, how much ballast must be carried, and how much fuel will be consumed. The officer-in-charge gives the requirements to the chief engineer, who superintends the taking on board of the fuel and the gas and other mechanical supplies.

The gas is admitted to the ship through a central gassing hose which leads off to each balloonet, the gas coming in directly from the storage holders through large mains sunk in the hangar floor or from the mains in a mooring mast. Four or five men are stationed along the keel inside the ship when gassing is going on to check the amount going to each bag and tie them off when the desired percentage of fill is reached. One man stands by the valve in the gas main and turns off and on as ordered, while the gassing coxswain, on duty in the ship, keeps track of how much gas is going into the ship, which bags it goes into, a list of the bags filled and tied off, and other gassing details.

As the gas enters the ship the lift increases, and this is overcome by putting water ballast aboard, superintended by a detail of four to six men. This is accurate work, for it must be remembered that large rigid airships are six hundred or more feet long, and too much water in one end or the other results in an upsetting movement which brings the overbalanced end down on the hangar floor, or in dangerous proximity to the ground if at a mast, and exerts an excessive lift on the other, a condition which may result in damage to the framework.

While the water ballast is being taken in the fuel supply comes aboard directed by the engineer's force, the fuel being distributed in tanks along the ship so that her "trim" may be maintained. Water ballast and fuel must not be taken on board at a faster rate than the incoming gas, so that the buoyancy of the ship may not be materially changed but kept approximately the same at all times.

After the ship is gassed, fueled, and ballasted, very careful lift and trim charts are worked out showing the amount and

location of all fuel and ballast. These charts are posted in the pilot house and are constantly referred to by the operating officer on all flights. Finally, the engineers inspect and turn over all motors, and the ship is ready for flight.

When the crew goes on board a sufficient amount of ballast has to be immediately discharged to compensate for their weight. When passengers and freight come aboard more ballast has to be discharged. It will thus be seen that the airship's crew is kept very busy just prior to a voyage.

If starting from a hanger, an additional thousand pounds of ballast is discharged to increase the buoyancy and thus facilitate the ship's handling and give it positive lift for leaving the ground.

An airship flight is carried out, as far as possible, along the lines of any seagoing operation. All orders are given and all watches stood and relieved just the same as on a surface ship. During flight, in addition to the two helmsmen, there is on duty in the control car, the captain of the ship or the first lieutenant, the senior navigating officer, an assistant navigating officer, and one other watch-standing officer who relieves the captain or first lieutenant when requested; otherwise, he makes frequent tours of inspection along the keel to see that the gas bags are in proper position, the valves functioning, and the riggers on duty at their stations. The watch is relieved every four hours, a procedure carried out on all ships. In the radio cabin, generally in the control car, there is a radio operator always on watch.

Every two hours the gasoline supply is checked, the amount remaining computed, and its location posted on the chart in the control car. The engineer officer inspects the various power units, checking their operation at frequent intervals, and he also keeps an eye on the gasoline supply along the keel. If it is not necessary to utilize all the power units at one time, the engineer officer advises the officer having the deck the units that are to be used and those in reserve or being overhauled.

Another touch which reminds one of surface ships is the way orders are transmitted from the control car to the power units. An engine telegraph is used, designed, of course, for airships. When it is desired to "conn" the ship, orders are given to the steersman in accordance with Navy practice. Orders to the height

steersman are given in a similar manner, although they are varied to suit the circumstances.

The crew of a three-million-cubic-foot airship, for commercial purposes, numbers about twenty men. Military and naval craft, however, carrying bombs, machine guns, and aerial cannon, would employ a larger crew, including ordnance and gunnery officers and men.

Quarters for passengers in the newest airships are gorgeously decorated, luxuriously upholstered, and more comfortable than any train or steamship could possibly be, and this, plus the stability of the airship, furnishes a method of travel unsurpassed by any other known means. In the British passenger airship *R-36*, are accommodations for fifty passengers on a scale rivaling that of the highest class hotels.

In the *Paris Daily News* the *R-36* was described as a flying palace, in which travelers are lulled to sleep in the sky. The ship is 672 feet long, has a lifting power of sixty-three tons, a maximum speed of sixty-five miles an hour, and a cruising range of 4,000 miles.

To quote from the *Daily News*: "Entering the passenger car one is struck by the delicate construction—slender aluminum pillars and semi-transparent walls of 'doped' cotton, stretched tightly over a marvellous framework. The dining-room, with its linen-covered and silver-laden tables, its rugs and soft curtains, is reminiscent of a cosy city café. The sleeping quarters are a marvel of ingenuity. There are two rows of cabins, each accommodating two passengers on light hammock-slung beds, the finest sleeping-car accommodation available. During the day the beds are folded up, and the apartment is transformed into a magnificent drawing-room with delicate light-blue curtains and deep, comfortable lounge chairs."

Are airships safe? Indeed they are. Millions of miles have been flown in airships, and hundreds of thousands of passengers carried without the loss of a life. Vulnerability in war must not be confused with peace-time operation of airships. A comparatively large number of German rigid airships were lost by gunfire during the war. In fact, they might be considered to be particularly vulnerable in battle, but so were concrete and steel forts, battleships, and battle cruisers.

Fire is popularly regarded as the chief danger to airship operation, but while the fire hazard exists, very few ships, except in battle, have been so destroyed in operation. Of course, open fires are prohibited, and smoking is not allowed, the cooking and heating being done by electricity. This is because the lifting gas, hydrogen, is by itself inflammable and gasoline fumes, also inflammable, are sometimes present inside the envelope.

American rigid airships, however, will not be exposed to these dangers. The buoyant medium will be helium, of which this country contains practically all of the world's supply. An engine is now being tested in one of the great manufacturing plants of this country which will do away with gasoline as a fuel, and with the fire hazard removed there can be no safer method of travel than by airship.

In answer to the question—"What good are airships?"—one need only say that they furnish the quickest, cleanest, most comfortable long-distance method of transportation known to man. No dust or cinders, no jerking and rattling, no seasickness or slatting about on a stormy sea. Comfort, cleanliness, and luxury, at a medium cost, make air transport an enjoyable and inexpensive experience.

There has been formed in the United States a great air transport corporation which will establish, within a year, several airship lines across the country, employing ships of enormous size, of great speed, and large carrying capacity. This will provide a supplementary means of transport in addition to our transcontinental railroads which will place the United States in the foremost position in aeronautical development in the world.

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## DER TAG

BY CAPTAIN J. F. HELLWEG, U. S. NAVY

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For many years all good Germans have been toasting "Der Tag" on every possible occasion. By good Germans is meant all those inhabitants of Germany and particularly Prussia whose sense of right and wrong is so perverted that they could, and did, commit the most terrible acts of "frightfulness"; could witness the most excruciating torture of their helpless victims without the slightest signs of remorse.

Bismarck, the idol of the Germans and a strong advocate of "frightfulness," is credited with the following order issued to the Prussian soldiers governing their actions in 1870 against the French: ". . . above all you must inflict *on the inhabitants of invaded towns* the maximum of suffering, so that they may become sick of the struggle and may bring pressure to bear on their government to discontinue it; *you must leave the people through whom you march only their eyes to weep with.*" And the German forces have obeyed this fiendish order literally during the recent war, as the French and Belgian citizens have learned to their sorrow.

The arrogance of the Germans was so great that they even toasted "Der Tag" in the presence of the citizens, and sometimes the officials of those countries whom they meant to crush and ruin when "Der Tag" dawned.

On the twenty-first day of November, 1918, the German high sea fleet appeared out of the mist at 9:43 A. M., in latitude fifty-six degrees, eleven minutes, north; and longitude one degree, twenty minutes, west, with guns laid fore-and-aft, and there met

the grand fleet under the command of Admiral Sir David Beatty, R. N., and proceeded into a British port escorted by the British, French, and American ships on both sides and all "cleared for action," for they were on their guard.

The German high seas fleet on that memorable day in November, 1918, consisted of the following ships, steaming in single column as indicated:

#### BATTLE CRUISERS

*Seydlitz*—Flying the flag of Commodore Tägert.

*Moltke*

*Derfflinger*

*Hindenburg*

*Von Der Tan*

#### BATTLESHIPS

*Friedrich Der Grosse*—Flying the flag of Rear Admiral Von Reuter, the commander-in-chief of the German high seas fleet.

*König-Albert*

*Kaiser*

*Kaiserin*

*Prinzregent Luitpold*

*Bayern*

*Kronprinz Wilhelm*

*Mark Graf*

*Grosser Kurfürst*

#### CRUISERS

*Karlsruhe*—Flying the flag of Commodore Harder.

*Frankfurt*

*Emden*

*Nurnberg*

*Brummer*

*Koln*

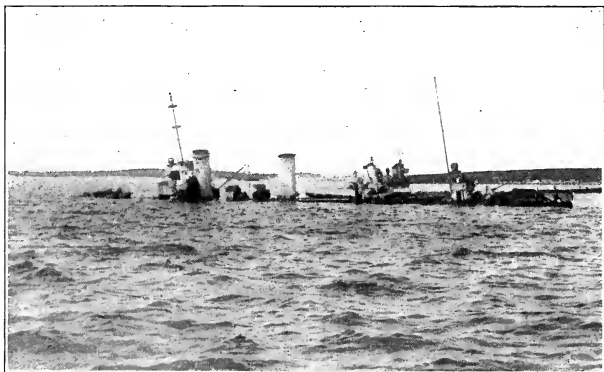
*Bremse*

None but the Germans themselves can fully appreciate how different was that twenty-first day of November, 1918, from "Der Tag" about which all good Germans had been dreaming and which they had been toasting for years. The rest of mankind can thank God that the German's "Der Tag" never dawned.





BATTLE CRUISER, "DERFFLINGER" TAKING HER FINAL PLUNGE AT 2:45 P. M.,  
JUNE 21, 1919. SHE WAS ONE OF THEIR BEST SHIPS.  
Note the lack of heavy top-hammer such as the H. M. S. *Hood* and the  
U. S. S. *Tennessee* have.



GERMAN DESTROYERS SINKING AFTER BEING SCUTTLED BY THEIR OWN  
CREWS AT SCAPA FLOW



On the twenty-first day of June, 1919, seven months later to the day, the Germans ran true to form and scuttled their ships at Scapa Flow.

The work of raising the smaller ships was under way as soon as practicable, and nine months later—March, 1920—I was detached from duty in France and proceeded to Rosyth, Scotland, for duty in connection with the refitting of the ex-German ships allocated to the United States for their trip home.

A more dismal sight than the ex-German destroyers can hardly be pictured. Moored by pairs to buoys in the Firth of Forth, rusted and stripped, sides stove in, masts carried away, rails bent and twisted, bridges sagging, bridge screens tattered and flapping in the sharp wind, decks littered with wreckage, and guns pointed skyward, they looked like battle-stained, disheveled, beaten German troopers with both hands in the air, yelling "Kamerad."

Even the boats themselves listed toward each other as if they were too exhausted and too crippled to stand on an even keel. They truly presented a sombre picture, their silhouettes hazily outlined against the gray lowering sky of a stormy Scotch March afternoon.

On going on board the ships allocated to the United States, it was quickly seen that the task of preparing them for their long trip to the United States would be a big one, one that would tax the ability and the perseverance of all hands. As the ships had been submerged for a long period, they had naturally collected a considerable amount of silt in practically all compartments. Most of the compartments were still partially flooded, and all were filled with every conceivable kind of wreckage.

Most of the gear that had not been wrecked had been carried off, so that it was with a rather depressed feeling that I completed my first inspection and returned on board the ship of the senior American naval officer present. A couple hours in the cheerful company of Captain Kimberly, who displayed an unsuspected amount of dry humor during an excellent and much appreciated dinner, made everything look much brighter.

At that time, 12 March, 1920, the following American ships were in the Firth of Forth: U. S. S. *Chattanooga*, Captain V. A. Kimberly; U. S. S. *Panther*, Commander C. E. Wood; U. S. S.

*Hovey*, Commander S. B. McKinney; U. S. S. *Chandler*, Lieutenant-Commander F. Cogswell.

A few days later the U. S. S. *Ballard*, Lieutenant-Commander H. T. Settle, arrived; and a couple weeks later the three mine sweepers: U. S. S. *Red Wing*, Lieutenant F. C. A. Plagemann; U. S. S. *Rail*, Lieutenant A. E. Freed; U. S. S. *Falcon*, Lieutenant W. B. Buchanan, arrived from the United States for duty in connection with the towing of the three ex-German destroyers home.

Working parties from all these ships were immediately put on board the three destroyers *G-102*, *S-132*, and *V-43*, and the cruiser *Frankfurt* to dig out the dirt preparatory to starting repairs. The inspection of the *Frankfurt*, a 5,500-ton cruiser, showed her to be in much the same condition as the destroyers; compartments flooded, nearly everything either wrecked or gone, and the entire ship littered with an indescribable mass of wreckage.

All four of these ships had to be docked, cleaned and painted. Their propellers had to be removed to facilitate towing home, as it had been decided that the time and expense to put them in condition to steam home was not warranted. All the numerous holes in their sides and under-water bodies had to be plugged or blanked as a safety precaution for the long trip across the open sea.

In addition, quarters had to be made habitable, cleaned, disinfected, and painted, galley arrangements had to be provided, and all water tanks and their pipes had to be scrubbed, disinfected, and gone over very carefully as a precautionary measure.

As two of the destroyers had very low freeboard, and as many deck fittings such as ventilator cowls, etc., were missing, all deck openings had to be blanked off to insure against later trouble in case we should encounter heavy weather. In this task the U. S. S. *Panther* did excellent work, assisted by the crews of the destroyers.

The British naval officers were very courteous throughout our stay at Rosyth and at Port Edgar, particularly the admiral superintendent of the Rosyth dockyard, Rear-Admiral Sir John F. E. Green, R. N., who commanded the battle cruiser H. M. S. *New Zealand* at Jutland, and Captain Berwick Curtis, R. N., in command of the destroyer base at Port Edgar. During the war,

Captain Curtis had commanded in the Harwich Patrol, a most hazardous billet, and later had commanded a mining division and the H. M. S. *Abdiel* at Jutland, where his daring work was recognized and won for him a decoration by the King.

Thanks to the particularly generous coöperation of Captain Curtis, we were able to place our American destroyers in the destroyer docks at Port Edgar and to tie up an ex-German destroyer alongside each of ours, increasing the speed of our work enormously as long as the American destroyers remained with us.

In the meantime the U. S. S. *Panther*, our repair ship, was devoting her attention to the pumping out and cleaning of the cruiser *Frankfurt*, preparatory to the actual repair work.

I left France on 8 March, 1920, in a rush, as the ex-German dreadnaught was expected to sail from Germany immediately. Internal trouble prevented her sailing, until just when I was wondering whether she would ever sail, word came that she was due on the fifth of April.

Everything was made ready, but again it proved a false alarm. Late on the sixth of April, the British Admiralty notified us that a tug would be placed at our disposal the following morning to take us to meet the German convoy which was due to arrive.

All our arrangements had been very carefully prepared and completed for a long time, and it only needed the signal for all hands to be in their places.

Our Navy will long remember the damage done to the ex-German ships by German sympathizers in the early days of the war while the ships were lying in our ports interned. The later surreptitious attempts which were made will also be long remembered. Armed with this previous experience, we made careful plans to block any such efforts, or to minimize the results of such efforts. It need only be added that the Germans ran true to form, and that the only reason their efforts were not completely successful is because we had prepared to counteract them.

Our boarding party consisted of thirteen officers and fifty-four bluejackets borrowed from the various American ships in port. The party was provided with miner's lamps, electric torches, gas masks—the latter in case we had to send a rescue party into any compartment—tools, etc. A medical officer and a hospital party

accompanied us; and, in addition, there was an armed guard under the command of a particularly level-headed officer, for no one could foretell what disturbance might occur.

Shortly before two o'clock we made out smoke on the horizon, and soon the convoy hove in sight, led by the British battle cruiser H. M. S. *Tiger* and escorted on both sides by British destroyers.

The ex-German battleship *Nassau* was towing the *Ostfriesland*, and cast off as soon as our tugs rounded to close aboard. By three-thirty P. M., our party was on board and the British tugs took the *Ostfriesland* in tow and stood in toward our anchorage off Burntisland in the Firth of Forth.

The German crew, of which there were quite a number, were massed on deck in the vicinity of the gang-plank we threw aboard; a curious, ill-dressed, unshaven, and dirty looking lot, staring at us as we jumped on board. There was not an officer in sight, a German discourtesy that did not surprise me in the least. Just prior to our boarding, the men were again cautioned to have nothing to do with the crew, to confine their conversation strictly to the requirements, and to watch everything carefully. Accompanied by the British pilot and a helmsman, I made my way to the bridge where two officers were found. Their presence was acknowledged and then as completely ignored as they had ignored our coming on board ship.

On the way in to port, the ten inspection parties of blue-jackets, each under the immediate supervision of an officer, inspected their parts of the ship according to our plans in order to insure that everything was safe and seaworthy. As the *Ostfriesland* did not steam to Scotland from Germany but was towed, the size of her crew surprised me and immediately aroused my suspicions. With such a crew, they could methodically carry out all possible schemes after leaving port, and without the slightest risk.

The following extracts from my official report to the Department indicate the thoroughness with which they gutted the ship:

All copper and brass fittings, pipes, etc., were missing, leads hacked and cut, gauges were smashed, valves gone, and efforts made to injure motors. The electric leads to the cranes, auxiliary machinery, and winches had been chopped and torn apart. Other electric fittings had been torn loose and taken. The condition of the main engines was fair.

In the officers' quarters everything had been stripped. Some quarters were found in an indescribably filthy condition, apparently not the result of inadvertance, but of deliberate intention. For example: All officers' rooms were fitted with standard closing washstands like those fitted in the passengers' staterooms on the liners. In a number of cases these basins were filled with human faeces. Some were closed, others were open. The height of these basins above the deck necessitated their standing on chairs or boxes to use the basins in this manner. Between the time of our arrival on board the *Ostfriesland* about 3:30 P. M., and the time of the departure of the German crew, someone entered the admiral's quarters and capsized the remains of a tub of apple butter or similar looking substance on deck, and then splashed it about. In addition, they scrawled their usual parting salutation, "Deutschland Über Alles," on the bulkheads.

Some valves in out-of-the-way corners of small compartments were removed, leaving the pipes wide open. Before these were discovered and blank-flanged, we had several cases of flooding in various parts of the ship. The same filthy condition found in some of the officers' quarters was found in a number of other parts of the ship, resulting in a considerable amount of very distasteful work for the crew of the U. S. S. *Panther*. In defiling the compartments, they apparently selected those which were the most difficult to clean.

The radio room was completely stripped, nothing remaining except wires which were cut. Throughout the ship, fuses were generally missing, in many instances the boxes themselves being torn from their fittings and missing. The fire control terminals in gun rooms were destroyed, fire control buzzers and gongs missing, and visual indicators smashed or gone. All the securing lugs for the turrets were missing except two, which were evidently overlooked. The fire control and conning towers forward and aft were completely wrecked, gutted, wires slashed, and marks and indicators missing. The bridge was stripped of all navigational instruments.

All searchlights and their fittings were gone. Turret sights were missing. The port bower anchor and about seventy-five fathoms of chain from the anchors on board were also missing. The stern anchor and three kedge anchors had been removed. All

the lower boom gear, all boats except two dirty old thirty-foot cutters, even the lifeboats and their davits, had been removed. This last necessitated our purchasing lifeboats and their davits from the British dockyard and rigging them on the ship's sides. Signal yards and topmasts were missing, and all the masts' stays except three were missing, necessitating our fitting new mast stays to support the masts properly.

During the run up the Forth, I made a brief inspection of some parts of the ship and discovered numerous indications of elaborate preparations to loot the ship. They had made what appeared to be complete plans for the wholesale destruction of parts of the engineering and electrical equipment before their departure for Germany on their transport *Rugen* which had accompanied them. I shall always believe that their landfall was delayed till afternoon in order to insure their anchoring in port after dark, thereby giving them a legitimate excuse for remaining on board overnight. Whether they intended to transfer all of the gear to the *Rugen* during the night for return to Germany or to drop a large part of it overboard will never be known.

But inasmuch as they had dismounted several large motors and had them crated, it is reasonable to suppose that they intended taking them under cover of darkness to the *Rugen*. The wiring tunnel looked as if it had been used as a demolition chamber to fragment a fourteen-inch shell. Everything was cut to pieces.

They had even commenced to dismount the turret gear in the after turret. For what purpose is not known, but it is supposed that this gear was also to be carried off.

The destruction of plans which were necessary for the control of the flooding and drainage systems was very deliberate and thorough. The signs used to designate the different types of valves and connections were removed with a file or other sharp instrument and the connections in the vicinity of the drainage pumps were slashed in forty or more places so as to make them unintelligible. Sections of piping in various parts of the ship were removed and carried to other parts of the ship. I can not believe that this was deliberately done, it was too stupid, and not in accordance with their usual shrewd practices. Packing was removed from all stuffing boxes—possibly done in laying up the machinery. Most of this was easily found, but the pack-

ing in the expansion joints was the source of considerable trouble, as there were so many expansion joints, approximately sixty.

Acid in carboys in a small after compartment surrounded by bundles of waste paper, oil-soaked waste, and other combustible material could not have been an accident, it was too deliberately arranged. This compartment was immediately cleaned and the material thrown overboard.

It was quite dark when we anchored in the Firth of Forth shortly after eight o'clock near Burntisland. The German crew was immediately ordered off the ship, and was transferred to the *Rugen* by a British tug.

This unexpected order to clear the ship immediately, evidently capsized their plans. They protested, stating that it was impossible to get their dunnage together till morning; and, besides, they said they must stay to give my men instruction below.

They were allowed thirty minutes to clear the ship. Had they been permitted to remain on board all night, their night's lodging probably would have cost the United States government thousands of dollars. They might even have made it impossible to steam the *Ostfriesland* home. As they had the audacity to attempt to light fires in dead boilers while my men were down below en route to port, one can imagine what they would have done had they been on board all night. The chief engineer of the U. S. S. *Panther* and his men deserve great credit for blocking the efforts made to spoil things down below.

For days afterwards we continued to find additional evidence of their elaborate plans for the removal of motors, auxiliaries, blowers, pumps, motor-generators, ventilating motors, fittings, spare parts, etc., and the destruction of what was to be left. Small parts were collected and made in neat bundles securely lashed for easy handling.

One able-bodied German was discovered attempting to carry off a motor weighing approximately one hundred pounds, secreted in a box under his clothing. Two other motors, one smaller and one larger, were found in an easily accessible room on the main deck ready to be carried off. Our armed guard was stationed on deck and searched any man's effects which aroused suspicion.

Five busy weeks quickly passed, and the long expected transport, U. S. S. *Hancock*, Captain J. G. Church, arrived from the

United States with the officers and crew for the ex-German ships. Prior to her arrival, the dirtiest work on the *Ostfriesland* had been cleaned by the U. S. S. *Panther*, whose entire crew deserves great credit for what they accomplished when their small force available is considered.

Almost immediately after the arrival of the *Hancock*, orders were received to redistribute the crews on ships in the Forth, giving the ships to remain on the station, long-timers in exchange for their short-timers, sick, B. C. D. and G. C. M. prisoners. Soon after the redistribution of crews, the other ships which had been needed for some time in the Mediterranean and elsewhere, were detached; and, one by one, we saw them sail away until we were "on our own" with our German wrecks, the *Hancock*, and the *Panther*.

The *Hancock* brought over a complete set of machine tools, individual electric drive. One of the first things accomplished by the chief engineer, Lieutenant-Commander Karl Smith, was the installation of this shop under the forecastle on the port side. The entire compartment was assigned for this purpose, giving them an excellent shop. Even before the machines were completely installed and secured, they were in use; and from that time till the end, they were seldom idle.

After forty-one days of the hardest and dirtiest kind of work, officers and crew frequently working late into the night, the ship was clean enough and was ready to hoist the American flag. On the eighteenth of May, 1920, at 4:28 P. M., the U. S. S. *Ostfriesland* was placed in commission with appropriate ceremonies at the British dockyard at Rosyth, Scotland.

Having completed the repairs to the destroyers, they were placed in commission on the fifth of June, and sailed from Rosyth, Scotland, on the seventh of June on the first leg of their long journey home in tow of the three mine sweepers and convoyed by the U. S. S. *Hancock*. They arrived at Brest, France, four days later, having covered the first eight hundred miles without accident. The three mine sweepers immediately returned to Rosyth.

The remainder of the convoy, consisting of the *Ostfriesland* and the *Frankfurt*, sailed from Rosyth on the seventeenth of June for Brest, the *Frankfurt* in tow of two of the sweepers in



tandem with the third sweeper standing by. The *Frankfurt* had been placed in commission on the same day as the destroyers, and in her new coat of paint looked spic and span, a really handsome ship. The *Ostfriesland* sailed early in the morning and spent the forenoon compensating a compass which we had obtained from the *Hancock*. Our plans worked so well that we were just finishing when the *Frankfurt* passed in tow of the two sweepers.

The first sweeper's tow line was secured to a bridle on the second sweeper. This bridle was led aft on both sides, turns being taken on all bitts, and the ends were well secured. The second sweeper paid out her towing hawser to the *Frankfurt* and when everything was set, they "gagged" the towing engine as it was not believed that the latter could stand the strain of the combined pull of both sweepers. The *Frankfurt* secured the tow line to her port anchor chain and veered about thirty fathoms of it. This rig behaved beautifully until the night before we reached Brest, when it began working in the seaway, and finally, the next morning when in sight of Ushant, the line let go, causing a delay of several hours.

During this run to Brest, we encountered much fog and the run down the English Channel was made as much on soundings as on bearings. We had wonderful luck for the fog lifted each time an important point was reached where the course had to be materially altered. The navigator, Lieutenant-Commander S. B. Robinson, did excellent work carrying the convoy through the English Channel under such adverse weather conditions. He made an excellent landfall on Ushant on the morning of the fourth day.

Shortly after our departure from Rosyth, the naval attaché at London requested me to investigate the possibility of carrying home on some ship in the convoy one or more of the naval guns stored at Rosyth. These guns had formed a reserve for Admiral Rodman's battleships which had operated with the British grand fleet during the war. Two twelve-inch guns had been sent home at great expense on a merchant ship. Almost two years after the armistice had been signed, two more twelve-inch and two fourteen-inch guns still remained at Rosyth.

Immediately upon the receipt of Captain Sexton's letter, I had templates made of the guns and tried them in various places on the

main deck of the *Ostfriesland* as we all realized that there was nothing else in the convoy that could possibly carry even one of the guns, without great delay and considerable risk. After some dovetailing and cutting away of deck fittings around the turrets, we found four places for the four guns symmetrically arranged both fore-and-aft and athwartships.

The next question was whether we could carry such a load—approximately two hundred and sixty tons—so high up without making us tender. Our store rooms were practically empty and the magazines were absolutely empty, while our bunkers were so arranged in upper and lower bunkers that I did not know how she might behave in a seaway. The whole undertaking of preparing these ex-German ships and getting them home was a little out of the ordinary, owing to their condition and the actions of their previous crews. We had no precedents to refer to, in fact we had to make our own as we went along, therefore, one undertaking more or less made little difference.

The young British naval constructor coöperated perfectly with us and carried out the inclining experiment, which I requested him to make, exactly at the time I specified so as not to interfere with the other urgent ship's work. The naval attaché, Captain Sexton, U. S. Navy, had particularly specified that while the work of transporting the guns to the United States was very important and would relieve him of a long delayed "white elephant," at the same time it must not delay the departure of the convoy in the slightest.

The coöperation of the young British naval constructor was therefore particularly appreciated. As soon as the inclining experiment showed that we could safely carry the load, the guns were rushed on board. I shall never cease to admire the teamwork of that rigger's gang at Rosyth. With the assistance of the big floating crane, they brought those guns alongside two at a time and whipped them on board as quickly and as easily as I would carry a suitcase on board. The two twelve-inch guns being shorter, were carried athwartships, one abaft the forecastle turret and under its overhang; and the other, forward of the quarter-deck turret and secured under its overhang. The forward one was secured muzzle to starboard and the after one muzzle to port. Heel lashings secured to large pad eyes temporarily fitted to the

deck prevented any end movement of the guns; while body lashings held the guns down snugly in their cradles. These cradles were made of twelve by twelve timbers tied together with iron straps, forming very wide bearings for the guns. Heavy angle irons bolted to the deck parallel and spaced equal to the width of the cradles formed channels and held them in place. The cradles were not secured to these angle irons, the idea being that if the guns worked in a seaway, their movement would tend to rock the cradles on one or the other of their fore-and-aft edges, and that this rocking motion would result in a tendency to lift the guns slightly thereby jamming their body lashings more tightly. This scheme worked beautifully, and the guns were snug throughout the trip. By placing all the guns close to turrets we took advantage of the extra stiffness of the decks and the heavy bulkheads and therefore had practically no shoring to do between decks. However, when we had been at sea for some time and the chief engineer blamed his trouble with the starboard engine on the concentrated loads on deck, it is possible that he was right.

The two fourteen-inch guns were a little more difficult to get in place, due to their greater length. They had to be worked in under the overhang of the one waist turret and against the other on the opposite side of the ship, without being able to make a straight lift owing to the presence of the fore-and-aft bridge.

The forward one was run from starboard bow to port quarter, muzzle to port, and under the overhang of the port forward turret. The breech was secured against the starboard forward turret.

The after fourteen-inch gun was run in the opposite direction; that is, from the port bow to the starboard quarter with the muzzle to starboard in order to balance weights. The breech was secured against the port after turret, and the muzzle against the starboard after turret.

This arrangement distributed the weights evenly throughout the ship's length and kept them as near the center line as possible. But to go along the deck at night was somewhat like going through a back alley in a Scotch town in the early daylight. I have heard that the Highland Fling originated in the Scotties jumping over the trash and ash piles in the back alleys in the

early morning on their way to work. The cost of transporting such awkward and concentrated weights is very expensive as the commercial carriers must be laid up to have extra fittings and special heavy shorings installed to support the weights. Of course, you pay not only for the work of installing all these special fittings but for their ripping out afterwards; and, in addition, you pay for all the time the ship lies idle in port at both ends of the trip, plus the actual cost of transportation.

I have heard considerable adverse criticism about bringing home the ex-German ships, but from a business point of view it was not such a bad venture. The carrying home of four large naval guns by the *Ostfriesland* represents a very neat sum saved, not to mention the release of cargo carriers which otherwise would have had to do the work at the expense of considerable loss of time. Besides, almost two years had elapsed since the armistice, and our guns were still in Scotland waiting for available bottoms to bring them home.

It has been stated that the actual saving in transportation charges represented approximately twice the amount of money allowed me by the Department for the fitting out of the entire five vessels. This may or may not be accurate, but it can not be far wrong.

At Brest, France, we made our final preparations for our long leg home, taking all stores remaining at Brest from our large "War Naval Base" there. In addition, all the Navy dead which had been disinterred in France and which were ready for shipment, were placed on board the U. S. S. *Hancock* for transportation to New York.

Prior to our departure from Scotland we had been limited in the amount of coal we could take. We therefore had to fill our bunkers at Brest where the French Navy Department owed us a considerable amount of coal. We soon discovered one reason why the French Navy was staying in port—German coal. The only coal the French had to give us—they were trying to use it themselves—was coal delivered from Germany. I received a cablegram from Captain Kimberly of the U. S. S. *Chattanooga*, sent from the west coast of Africa, warning me about the German coal. However, we had to take that or nothing. No further remarks need be made except to note that we could

not reach America with three thousand tons of such trash. It was a mixture of slate, slag, sand, and dirt, which formed a blanket-like cake in the furnaces extending over a large section. To slice this was practically impossible. The trip home with such stuff was a "man-killer" down below.

In my entire career, I have never seen so many heat prostrations. These were the result of poor ventilation, high temperature in the fire rooms, and heavy work—occasioned by the poor coal—beyond the endurance of the fire room force. Even the more experienced men could not stand the work; and, before the trip had fairly started, calls for help from the deck force were made, and continued throughout the voyage. We averaged about five to seven heat prostrations every watch.

Due to poor quality of the coal and also to a serious casualty which occurred, I had to change my plans and go into Punta Delgada, Azores, where we found some real coal, and made our repairs. On reaching New York, we could not even give that coal away. A board of engineering officers analyzed it, and found it so inferior in quality, so low in B. T. U.s, that they recommended leaving it in the ship. It would not even pay to take it out of the ship, and about one thousand tons of that coal still remain in the *Ostfriesland* and the *Frankfurt* as a reminder of how the Germans are living up to their peace terms regarding the delivery of coal to France.

At Brest we had another redistribution of personnel due to our having to send one hundred and twenty-nine men to the U. S. S. *Pittsburg* in exchange for short-timers, G. C. M. and B. C. D. prisoners, and others that had to be sent home. This caused a slight delay as we again had to train men in the handling of auxiliaries before we could risk going to sea. The *Ostfriesland's* electrical auxiliaries, of which there were a number, required special training before we could undertake the towing of the *Frankfurt*, as our trip from Rosyth had amply proved.

We sailed from Brest, France, on the thirteenth day of July, the *Ostfriesland* taking the *Frankfurt* in tow outside. Prior to our departure from Rosyth, we had prepared our towing gear very carefully, allowing an ample factor of safety on everything. Everyone was thoroughly indoctrinated so that the plans would be quickly carried out. Complete special signals were arranged

to cover probable occurrences, and to insure that all ships would quickly grasp the situation.

One elastic cruising formation was arranged in order to demand the least variation in the steaming of the separate units; at the same time to insure that all units were continuously within easy signal distance. As no ship except the U. S. S. *Hancock* had more than one radio operator we were dependent on visual signals. Our radio operators stood watch in rotation by ships in order to maintain a continuous radio watch for outside calls. The U. S. S. *Hancock* was the only one that could send a message any distance, the rest of us having small field sets, but we could all listen in. Radio communication was maintained throughout the trip by the U. S. S. *Hancock*, first through European stations, then through the Azores, and finally through Cape Race. Only one day were we out of communication, and that day we relayed our messages through a merchant ship. The U. S. S. *Hancock* deserves credit for her fine work.

The towing gear we rigged consisted of a six-inch steel wire bridle, one complete round turn of which was taken around the barbette of our after turret. Both ends were led aft, each on its own side of the deck, and through the midship stern chock. Solid thimbles were spliced into both ends. These ends were shackled to a three-inch heart shackle by two two-and-one-half-inch Navy standard towing shackles. Shackled into the outboard end of the heart shackle was a three-inch pelican hook which hooked into the forward shackle of the tow line.

The tow line consisted of two six-and-one-quarter-inch galvanized steel wire lines, each one hundred and fifty fathoms long, shackled together with two two-and-one-half-inch Navy standard shackles, back to back. Solid thimbles were spliced into both ends of both tow lines. The towing shackles were tested to sixty tons, and the heart shackle and the pelican hook, to eighty tons. The after shackle of the tow line was shackled into the *Frankfurt's* port chain, which was veered to forty-five fathoms. A three-inch wire messenger was attached to the tow line by a chain strap about twenty feet abaft of the pelican hook, and was secured on deck.

As a preventer, the *Kearsarge's* bridle—entirely inadequate for the purpose for which sent over—was rove through the three-

inch heart shackle and both ends were led forward on deck. Its inadequate length was supplemented by eight parts of one-and-one-quarter-inch steel wire by which its ends were secured to the bitts on both sides of the quarter deck. Where the preventer passed through the heart shackle, chafing gear was put on.

A special towing hawser capstan on the starboard side of the quarter deck fitted with twin vertical drums, scored to take large-sized hawsers, was of great assistance in handling the line, as was also a very fine hawser controller placed well aft on the starboard side of the quarter deck.

In leaving Brest, the sweepers and their respective ex-German destroyers left the inner harbor first, immediately followed by the *Frankfurt* in tow of a large French tug. As soon as she was clear, the *Ostfriesland* stood out, followed by the U. S. S. *Hancock*.

On reaching a prearranged point in about forty-five fathoms of water, the French tug dropped the *Frankfurt* and the *Ostfriesland* picked her up, running the tow line with a five-inch hauling line. It took us about twenty-eight minutes to run the line and make fast. Our cruising formation consisted of the *Ostfriesland* towing the *Frankfurt* forming the center and guide unit. One thousand yards on my starboard side was the U. S. S. *Rail* towing the ex-German destroyer *S-132*. An equal distance on my port side was the U. S. S. *Falcon* with the *G-102*. The *Rail* and *Falcon* had orders to maintain such position that they and their respective tows were abeam of the interval between my stern and the *Frankfurt's* bow. My idea was to present a solid target on either beam in order to discourage anyone's trying to cut through between my stern and the *Frankfurt's* bow—she was being towed with a tow line two thousand and seventy-five feet long—and coming to grief.

The U. S. S. *Hancock* took her position astern of the *Frankfurt* and slightly on her starboard quarter, with instructions to maneuver in case anyone went overboard from either the *Ostfriesland* or the *Frankfurt* as we could not very well do anything with such a long tow line out, and the *Frankfurt* could do nothing.

The U. S. S. *Red Wing* took position on the port beam on the *Hancock* and split the interval between the *Ostfriesland* and the *Falcon*.

This formation was very elastic and allowed any unit to jockey forward and aft without affecting any other unit, thereby saving fuel.

In spite of my efforts to discourage any vessel's trying to cut through our column, on two occasions, both at night, vessels acted as if they contemplated trying it. In the first instance, a large, brilliantly lighted vessel, probably a passenger ship, tried to cross from our starboard side, changed her mind, made a complete circle and crossed astern of the formation. In the second instance, a tramp whose officer of the watch was either dozing or about the deck attending to the many duties that fall to the lot of the officer of the watch on a tramp, crossed our course close ahead. When he discovered his position he did his best to get out of it and succeeded after a fashion, assisted by our easing off to help him out.

In both instances, our efforts to learn their names proved unsuccessful.

From the point of view of economical steaming, the formation was ideal. Fortunately, there was no occasion for the *Hancock* to render any assistance to either the *Ostfriesland* or the *Frankfurt* in picking up men, but one afternoon it became necessary for the *Hancock* to stand by the *G-102* and to send medical assistance to that vessel. As long as possible, I watched with keen interest and pleasure the skilful handling of the *Hancock* in going close aboard the *G-102* while the rest of us steamed ahead at slow speed. The transfer of the sick man in a stretcher from the deck of the rolling destroyer to the boat alongside, and the quick hoisting of the boat with the stretcher case in it to the deck level where the man was passed in on deck was a pretty piece of work, but just what you would expect of Captain Church, who earned his reputation years ago in the old second flotilla. From the time the signal was sent the *Hancock* to stand by the *G-102* and render what assistance the circumstances demanded, until she was back in formation and we were all again at standard speed, was approximately forty minutes. In laying out our course home, the primary object was to get there with the least wear and tear on equipment and personnel, the former of which was unreliable; and the latter, short. I therefore hunted good weather, and naturally laid my course across all the "two per



cent blocks" on the hydrographic weather chart. I wish here to pay my respects to the accuracy of the hydrographic office's charts. We had "hand picked" weather all the way home, and seas that gave us only an easy comfortable motion; that is, if you do not ask the *V-43* what kind of seas we encountered. Her rolling was a constant source of amusement to the rest of us. Before leaving Scotland, I realized that Brest would be our last chance for oiling the sweepers. With this in mind, and also to give the ex-German destroyers more stability, instructions were given to prepare their fuel tanks for oil, and to fill them promptly on arrival at Brest while awaiting my arrival there. It was my intention to send the sweepers into Punta Delgada with their destroyers to refill with oil, each from his own tow. As soon as a landfall was made on St. Michael's island, the rest of the convoy was to have slowed down and proceeded at reduced speed along the South coast, while the sweepers speeded up and carried out their part of the program, rejoining us as soon as possible. The first part of the program was carried out. We also slowed down but only because we could not make port and get all ships inside the breakwater before dark. Owing to the serious condition regarding our coal consumption, and also the repairs that were absolutely necessary for safety, we had to go in to Punta Delgada where we remained one week coaling and refitting.

A long towing trip like this one is a standing invitation for all sorts of accidents even if you start with ships in good condition, but to attempt such a trip with ships that had been purposely scuttled by their crews, or stripped and purposely injured as had been the *Ostfriesland*, is a guarantee against a too-monotonous trip. As was expected, we began having trouble within six hours after leaving Rosyth even though we had anticipated everything possible. On our arrival at Brest, we made necessary repairs, and within a day after leaving that port, other trouble developed. The combination of towing, transporting heavy weights on deck, and the known condition of tow engines soon resulted in serious trouble, and our insistence on putting all three engines in commission before leaving Rosyth was soon justified.

Lieutenant-Commander Karl Smith, U. S. Navy, our chief engineer, can not be given too much credit for the results accomplished in the preparation of the *Ostfriesland's* engineering department for the trip home, and his resourcefulness in meeting all requirements during the trip home. I do not believe there are many officers who fully appreciate what a tremendous undertaking Smith had. Some of the situations that developed, necessitating accurate knowledge and quick action, gave Smith an opportunity to demonstrate his technical ability, particularly in electricity. Time was such an important factor that it had to be kept constantly in mind in all our operations.

That we beat the estimated time for the refitting of the five ships by forty-eight days was not because the work was easier than anticipated, but because the executive officer, Commander B. Dutton, Mr. Smith, and all hands forward and aft, worked day and night to make a daily showing. Our aim was to accomplish something definite each day, and it was remarkable to see how that spirit spread through the entire ship's company.

The plans were so carefully laid and so closely supervised that all work in all departments was completed within forty-eight hours after the completion of our dock trials at Rosyth. Only by perfect coöperation could such results have been accomplished, and everyone connected with this task deserves credit for the expedition with which the work was accomplished.

Due to repeated transfers of enlisted force, the personnel had to be trained three times before we finally started home. This in itself was a problem for the engineer officers because of the unfamiliarity of our bluejackets with the German equipment, valves, auxiliaries, etc. A couple days out from Brest we began having serious trouble with the starboard main engine. The middle engine was coupled up, and without stopping the other engines, the starboard one was stopped and the starboard high pressure connecting rod was swung and the main bearings were lifted twice within twenty-four hours. The execution of such repairs without dropping out of formation reflects great credit on the entire engineer force. Many incidents occurred on board all ships in the convoy, some laughable; others not. Owing to the transfer of men to the ships remaining on the European station and the receipt of their short-timers and others, we bene-

fited in one way as we obtained more experienced men. On the other hand, we suffered, as we also received some of the worst element of the European station, the G. C. M. and B. C. D. men. A few days before reaching the Azores, we had a serious accident in the steaming fire room. A six-inch suction line from a sea valve carried away just inside the skin of the ship and in an almost inaccessible place. Before temporary repairs could be effected, the fire room was badly flooded. On arrival at Punta Delgada, the local repair plants wanted a week's delay before starting repairs and a week for the repairs. Not relishing such a delay, a search was made of the *Frankfurt* and a pipe was found that would answer very well. The modifications to this pipe and its installation on the *Ostfriesland* required one week only. After leaving the Azores, we encountered very warm weather, and as the *Ostfriesland* was built for service in the Baltic and North Sea, the result was soon apparent. So many men from deck were sent below to fill in that we were finally reduced to the helmsman, a quartermaster, a lifeboat's crew and the tow line lookout. The officer of the deck was his own lookout, and the junior officer of the watch—a warrant officer—was messenger and all the rest of the deck details. The night before we arrived off New York, the *Frankfurt's* helm jammed hard left and for a few minutes it looked like an all-night's task, picking up our tow line. Fortunately our good luck did not forsake us, and we did not part the line. Before reaching shallow water, we took in the forward section of our tow line, and shackled the three-inch pelican hook into the forward shackle of the second section of the tow line. On reaching Ambrose Channel Lightship, the *Frankfurt* let go the line and, on heaving it in, we found it brightly polished by its few hours' towing in shallow water, as we had expected.

We all sighed a deep sigh of relief when the line was finally reported in on deck, and we were free to start in to port minus our tow, which the navy yard tugs had picked up.

"Der Tag" dawned for us on the ninth of August, 1920, when we stood in to New York harbor on the fifty-fourth day after our departure from Rosyth, Scotland.

As we passed the Goddess of Liberty, I could not help recalling the story of the arrival in New York long after the

armistice of a solitary negro trooper on a transport loaded down with white troops.

He was hanging over the port rail forward watching everything with keen delight. Suddenly he looked up as the transport was passing the Goddess of Liberty and, with a broad grin, sang out: "Put down yo' light, honey, I'se home."

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## A SIX-YEAR COURSE AT THE NAVAL ACADEMY

BY LIEUT. W. O. HENRY, U. S. NAVY

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All of us who are interested in the Navy are interested to a greater or lesser degree in the Naval Academy and quite often give voice to some idea that is in our heads concerning it—sometimes knocking—sometimes offering a bit of constructive criticism which is usually poorly thought out with not a very good conception of just what is going on in the Naval Academy at the time or the result on the whole scheme of things in the Service.

Now I have an idea (and of course referring to the above statement, I will say it is good)—I must say for it that I am whole-heartedly behind it, and have considered putting it through a feeble pen for several years, also that I do not believe that everybody else is all wrong and would be willing to be convinced that somebody else's ideas in parts of it are better than my own. I believe in it, now see what you think about it, then show me where you disagree.

Let us consider first, just what our object is at the Naval Academy—our object is to lay the keel of an officer; to give the midshipmen the fundamentals that John Paul Jones calls for when he tells what an officer should be. (You have read the extract from his letter that is printed on the bottom of your fitness reports—a little Bible all in itself, that extract.) I hope you are agreeing with me so far. We do not wish to turn out an admiral, or a lieutenant or even a good ensign, but we do want to turn out a man—a gentleman (not necessarily a Chesterfield)—an embryo officer who will shortly be a good ensign with the love of the service cast in his heart and the

ambition to work and fit himself for his duties firmly fixed in his system. Do we do this now or have we done this in the case of most of our graduates for the past good many years? And if we have done it have we made as good a job of it as we might have done?

As we go at present a youngster leaves the Naval Academy after a very hard four years of routine life.—crammed full of work, study and some play. In his different courses of study he has assimilated many things, some very hazily, with no resulting clear impression of the subject, and some things perhaps too much in detail to be of use to him in anything except some particular detail on board ship. He leaves the Academy sick of books and a good many “of him” sick of the Naval Academy—expressing the wish that he may never see the place again. Some of these, ensigns they now are, have a love for the Service, others will develop it, and some others never will. Very few understand the customs of the service, haven’t the loyalty which they should have to those above them and the service as a whole. The only ships they have seen or cruised on are ships thrown hurriedly into commission with makeshift crews—dirty below and doubtful as to their cruising ability. The ship’s organizations they have seen and been a part of are too oftentimes makeshift affairs put into effect by an overworked executive officer who has just joined, and has had a “hard row to hoe” with his ship and his crew. This ensign has seen officers of all sorts, most of them temporarily attached, to say the least of the matter (expecting to go to a real ship soon), some of indifferent caliber and others unquestionably unqualified for their rank. Some of this lately has been due to our “after the war” difficulties—but why so, necessarily? Do not we all of us learn more by example and seeing than we do out of a book and hearing? If we do not produce good officers how will we have a good Navy? If we do not give the midshipmen the best that we possibly can, show them things that are done properly, take them to sea on ships that are ships and not floating mechanisms with a gang of men aboard, how may we expect to commission them as ensigns and expect them to very shortly carry out the duties of a line officer according to the standards we have set? Even if we did send a midshipman to sea on his summer prac-

tice cruises on number one ships—does he have the time or the opportunity to acquire a good knowledge of anything? He joins his ship more or less “done in” from the academic year and starts in with a mapped-out schedule of duties, watches, notebook work, and study—the study especially he needs a rest from. In three months’ time he barely settles down aboard ship. He feels that he is only a temporary factor in the life of the ship, and unfortunately, some of those above him lead him to believe just that very thing, that he is in the way and hindering progress rather than making him feel that he is a part of the ship, and of value. It wouldn’t matter whether he was of any value at the time or not, he should think that he is. His potential value is great and what is more, great either for good or for bad.

This is not altogether about the cruises of midshipmen, but concerning their training as a whole. I maintain that we do not teach them:

1. The proper loyalty to their seniors. (That the King is King and that the King can do no wrong, etc.)
  2. Love of the service.
  3. Enough sailor man stuff.
  4. Enough general knowledge of the Navy and of the sea.
  5. Enough literature, international and world politics, public speaking, logic, psychology, and perhaps for some, enough polish.
- Also that we teach few subjects as thoroughly as we wish. The system of instruction we believe is good—but there isn’t enough time allotted to the different courses to get the most out of them.

Above all there is no opportunity for a midshipman to get a “liberal education.” His work is virtually all technical. Time cannot be spared from his daily routine to attend lectures on subjects of special or general interest. He gets a very good technical education—but where else, or in what other institution is there given a full technical education in four years, and of such a complex nature as the one at the Naval Academy added on to the foundation of a high school training only? The midshipman never gets a college education and to have a “liberal education” and at the same time be a naval officer he should get both. The course at the Academy has been added to and added to until it is a continuous grind from beginning to end, and less and less time is given to the development of character and es-

pecially military character, and the fundamental good human qualities that we must have in an officer. Character can't be taught, but it can be developed. The course of study and a midshipman's life while at the Naval Academy can be so planned that he involuntarily would have injected into him that loyalty to and the love of the service which stands first in the prime requisites of an officer. If he does not get those qualities which we maintain are the fundamental good ones ingrained in his character, we can get along better without him.

I propose a six-year course to include virtually everything that is given now with a very few additions. Two of that six years to be at sea—and not at the end of the four years' academic work, but sandwiched in between. In making the course a six-year one, I believe that we can turn out better officers—better sailor men, instill into them a love for the service and also the Naval Academy; make the school a pleasant and happy place to be in, and the cruises jaunts to be looked to with pleasure, also good enough in themselves to be something of an education. To make the cruises good we must leave most of the textbooks behind. Some few subjects, plain schooling, can be taught as well at sea as on shore, thereby lightening the regular academic work and padding out a few meager spots. I have in mind English and literature. Are not most of us woefully lacking in speaking and writing well, and even a common knowledge of the classics? Some will say that all such is unnecessary; however, would it not be a pleasure to have a good professional and technical foundation and added to it the power to express one's thoughts forcibly and well on every occasion in any company? The English course as it exists requires two and a half years. Little time can be given to reading any other than textbooks. I believe that the whole two-and-a-half-years' course could be completed and more gotten out of it on one cruise than is now done at the Academy, and what is more to the point, the midshipmen themselves would enjoy it. With work in English done on two cruises and a little time given to it at the Academy this course could be made really worth while.

Now we are not making cruises to teach English—but the cruises will be of such a nature that English and subjects of like nature that require reading only can be studied to advantage





The academic year is about three weeks longer than at present.

All leaves are longer, one in the middle of the course for about three months.

The cruises are of one year's duration, during the second and fifth year.

There are always four classes at the Academy.

Classes are called one to six inclusive. First class to Plebe respectively.

The same two ships, or one ship if the classes at the Academy are smaller than at present, would not make two successive cruises.

The ports of call should not be the same for the two cruises of any class.

Plebe summer to remain as it is now with additional lectures and talks.

#### I. The usual drills.

Seamanship.

Infantry.

Rifle Range.

Steam Engineering.

Gymnasium, etc., as now outlined.

All of which is to build up bodily health and physique, teach the Plebe the fundamentals of discipline and subordination, and whatever he can learn professionally. At the time he probably doesn't quite understand what it is all about anyway, but he does learn a good many nautical terms, the fundamentals of boat handling, how to carry himself and many points that will be of use to him later.

#### II. Many lectures and talks by officers, instructors, new graduates.

The customs of the Service in the Service.

Discipline.

Subordination.

What it means to be a midshipman.

The Naval Academy.

Athletics.

Ships and sailor men.

*Esprit de corps.*

What the Navy has to be proud of, and what the Naval Academy has to be proud of.

Commands and orders.

The honor system.

Hygiene, etc., etc.

All of the above, and more, to start the new man into the path of right thinking—good living, and plant the seed of the right kind of an unbeatable *esprit de corps*. If the Marine Corps expanded several times over during the war and made virtually every man in it feel that he was somebody, and that the Marine Corps was just about the best organization on earth, why can't we make the small regiment of midshipmen feel and believe the same thing? Crusty old sergeants spent as much time talking to their recruits as they did drilling them and—to the very best purpose—pride in their organization. A midshipman should be proud of being a midshipman and of the Naval Academy before anything else. The remainder will follow:

#### THE FIRST ACADEMIC YEAR

In regard to this let us make it less of a grind—don't crowd so much into a day—let it end by four o'clock and preferably sooner. By ending the day at least by four o'clock, and preferably three o'clock, more time can be devoted to athletics and recreation. Varsity teams will have the opportunity to attend all drills and still have more time for athletic work than they do now. The drill now comes at the end of a hard day's work—with a shorter day more would be gotten out of drills. Plenty of time for exercise in the afternoon helps a lot to make a good clear head at night for study.

Leave: send him home for six weeks—he wants to tell off a bit. He is mighty glad to get home. His people want to see him and will feel better satisfied about his going on a long cruise—far, far away from the United States, "Podunk—home—mamma and civilized folks," when they see his improvement in health, looks, and bearing. He should believe that he is in a wonderful place and if he does his people will also, and be con-

tented concerning his associates and surroundings. Their contentment will reflect again on his own attitude. Tell him all about the cruise he is going to take when he comes back—the ships he will go on and the ports he will visit.

### HIS FIRST CRUISE

1. Start it about the middle of July; he is now a youngster or fifth classman, and thinks that he knows a lot, he will soon be trying to learn a lot. My idea is for this cruise to last about one full year—cruise around the world. All the fifth class and all the second class will be on it. When the cruise is over they will be fourth class and first class respectively. At the present time, such a cruise would call for two ships—preferably dreadnaughts, these ships to be good ones, officered and manned from stem to stern by the very best. Picked enlisted men, who can act as instructors, have the best ideas of the Service and a love for it. Skeleton crews only they will be, the midshipmen will fill in the remainder and do virtually everything that is done on board, and they will spend enough time on every job to “get good at it.” The ships should not be overcrowded—plenty of room to eat and sleep—tables to work and write on—ships clean and in good shape when they start on the cruise.

Perhaps it would be hard to get enough enlisted men of the caliber we want to make up the skeleton crews of two ships. Let us send the best we can find, however. Midshipmen get many ideas and a lot of first-hand knowledge from them. I will not go further into detail and outline a cruise program for midshipmen. We want to keep them busy but at the same time allow a fair amount of time for recreation and sleep. There will be plenty of ship's work to do and they won't mind doing it—but don't overwork them with drills and study.

The object in taking the first cruise after the first year is to give the youngster a good idea of what he is going to do. To start a liking for going to sea in his heart, with good ships inside and an interesting cruise, nine out of ten I believe will soon be absolutely contented and happy. The cruise will be a reward for a successful completion of the first year's work—a thing to be looked forward to with pleasant anticipation, rather

than just a bad three months to get by with in one fashion or another.

The cruises will be an incentive for better work at the Academy. They will be an advertisement for the institution and will attract boys to enter who will be of the very sort we need in the service. Officers will like to make them—so will the men. Very few do now. Nearly all officers and all men like to go to sea on a real ship, be it large or small, but just so long as he feels that he is at home and not on a camping-out trip.

These midshipmen practice cruises should be the very best that the Department can make them. No trouble or reasonable expense should be spared in carrying them out from the beginning to the end—then they will be good. When midshipmen finish such a cruise they know a great deal about things in the Navy. They will be proud of the fact that they are in it—and when they go home they will have every red-blooded youngster in "Podunk" wishing that he were a midshipman. It would be a good time to weed out the few first classmen that still show lack of interest or plainly will not make officers. In a year's time on board ship I believe that this weeding out could be done with little or no chance of error.

Now I do not think that a ship is the ideal place to run a school in; at the same time I do believe that English, international law, naval history, history of the places visited and people in them, foreign customs and perhaps some modern languages, could be studied easily on board ship. Most of such work would take up the time midshipmen now devote to "Harry, the Left-Handed Poker Player," and "Susan, Queen of the Movies." Of course a boy's hair likes to stand up on end a part of the time—but he will have plenty of time to do good reading and pore through a few "thrillers" also. Yes, let us send some English professors along. The course in English at the Academy could be made much better and at the same time fewer hours devoted to it during the years spent at the Academy.

During the cruise the youngsters will do virtually everything on board ship—fire boilers, scrub decks and paintwork, chip redlead and paint, stand watches in all parts of the ship. I would suggest a watch in five at least. Remember that the midshipman is doing more than the seaman second class does—he

is studying some all the time, is pretty young and growing and needs a fair ration of sleep—does more than just eat, work, and sleep. If the routine is too stiff, any study at all will be a grind and worse than useless.

The books he needs on the cruise are, *Seamanship*, *Bluejackets Manual*, *Boat Book*, English books, and a good library.

On the completion of the cruise, about the middle of August, he goes on leave, to return the latter part of September. He is a proud boy now sure enough. Perhaps he has the "swell head" but it is a disease usually cured by a few knocks and several years. Most boys get it at about this time of life—it's as natural as the usual physical ailments.

Now for another academic year with work not so heavy as at present, especially English. The cruise will have helped him a great deal in the study of his professional subjects which he will get the following year. The academic year could extend to about the middle of June. A longer academic year will also ease up the work per day.

Then send him on about three months' leave, to return the first or second week in September.

Now for another academic year lasting until the middle of June or thereabouts. This year will be easier, anyway, if he has benefited by his first cruise.

At the end of the third academic year and the fourth year at school—off on leave again—about six weeks.

Then his last midshipman cruise. On this cruise he takes navigation books for study—*Seamanship*, *Electricity*, and English books for reference. He would spend more time with strictly professional work—but a little with English and languages. Most of the time he would be doing junior ensign duties, and the remainder, the duties of all the leading ratings. He should by now be learning an officer's point of view, learn how to lead his gang, take charge of almost any job about the deck or down below.

At the end of this cruise, first class year would be very easy and I believe he would in the main make an excellent regimental officer on account of his last year aboard ship. His last year at the academy could well be utilized in giving him more junior officer instruction, more international law, studies of foreign

navies and types of ships—more school of the ship, and ship handling, using tugs or destroyers. There would be time for a great many lectures on such subjects as leadership, international law, world politics, the elements of strategy and tactics, and so on.

When he graduates at the end of his last academic year, I believe you will have an ensign or a man who will be an ensign after a very short time aboard ship. He will love the Naval Academy and the Navy. He will have the good technical education a line officer should have, and have the liberal education and training to make him feel at ease in any company. He will be an asset to the Service. His junior ensign's work will come easily. He will not be carried as a liability on board ship for a year or so. His rank will be respected by those below him and he as an individual will be as soon as he steps on to the quarterdeck.

There will be no reason for the executive and first lieutenant to say, "The Navy School has certainly gone to hell"—but on the contrary they will feel proud of their institution and perhaps say to themselves, "He is better than I was when I started."





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## NEW GERMAN FLEET POSSIBILITIES

BY COLONEL CONSTRUCTOR E. DE VITO, ROYAL ITALIAN NAVY,  
*Chief of Design Division, Ship's Design Committee*

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### I. FRENCH FEARS

The small fleet allowed to Germany by the Peace Treaty is:  
Six battleships, *Deutschland* or *Lothringen* type;

Six light cruisers;

Twelve destroyers;

Twelve torpedo boats;

No submarines.

These ships may be replaced after a period of twenty years by battleships and cruisers and after fifteen years by destroyers and torpedo boats.

But the displacement of the new ships must be no more than:

10,000 tons for battleships;

6,000 tons for light cruisers;

800 tons for destroyers;

200 tons for torpedo boats.

French naval authorities and French Parliament fear that Germany will build new fast ships observing only the prescribed tonnages, but eluding the clauses about the type.

Mr. Guist'hau, the French Minister of Navy, in the naval debates of the French Parliament (June, 1921) has said that the Supreme Council increased from six to eight the number of battleships and of cruisers allowed to Germany. He has said also that in the next year<sup>1</sup> all these battleships and cruisers will be more than twenty years old and therefore they may be replaced by 10,000-ton and 6,000-ton ships.

<sup>1</sup> Really that happens in 1926.

Mr. Denise, the referendary of French naval bill, in the same debates has reported, without adhering to it, the opinion that Germany might build cruisers of 10,000 tons instead of armoured battleships; he also referred to a printed book in which it is said that Germany might launch sixteen cruisers to menace the safety of French maritime communications.

But actually Germany needs a policy of concentration and of intense work; therefore it does not appear possible either that Germany will rebuild many warships, or that she will elude the clauses of the Treaty, and even if Germany would make an effort she should develop rather aerial warfare.

However, it may be interesting to examine from a purely technical point of view what it is possible to build with the small displacement prescribed by Peace Treaty.

## 2. TORPEDO CRAFT

As Germany cannot build submarines she will be forced to develop torpedo craft. A torpedo boat of 200 tons at forty knots requires about 12,000 horsepower and this notable horsepower might be obtained by gasoline marine motors<sup>2</sup> acting on the shafts by reduction gears (I propose Parsons type) when the question of simultaneous reversing of motors and silent running will be solved.

The weight of such machinery, complete, at the rate of about 150 horsepower per ton might be about eighty tons. Following is the table of weight suggested.

Hull and outfit .....	tons	70
Equipment .....	tons	10
Machinery .....	tons	80
Fuel, normal .....	tons	15
Armament .....	tons	25
Displacement .....	tons	200
Fuel capacity .....	tons	60

The ratio of fuel capacity to the normal weight of fuel is very large; indeed, it is a little greater than in the most recent British

<sup>2</sup> As applied in lower degree, on motorboats, and as suggested for first line battleships by Commander de Feo (R. I. N.).

and French light cruisers; but it may be a means to increase the displacement without eluding the clause of the treaty.

The weight of twenty-five tons allotted to the armament is sufficient for one 4" anti-aircraft gun and two 21" torpedo tubes.

A destroyer of 800 tons at forty knots requires about 36,000 horsepower and this power may be obtained with a combination of 16,000 horsepower light steam machinery and 20,000 horsepower gasoline marine motors acting by gears on the shafts.

The weight allotted to the armament is sufficient for three 6" horsepower per ton for steam machinery, and of 150 horsepower per ton for gasoline motors, maybe less than 370 tons. The table of weights might be:

Hull and outfits .....	tons 280
Equipment .....	tons 35
Machinery .....	tons 370
Fuel (normal) .....	tons 40
Armament .....	tons 75
Displacement .....	tons 800
Fuel capacity .....	tons 160

The weight allotted to the armament is sufficient for three 6" guns and two double 21" torpedo tubes.

### 3. ORDINARY SOLUTIONS

Coming now to battleships and cruisers, what is possible to build with 10,000 tons and 6,000 tons?

It is clear that if classical and ordinary solutions are given to the question, one falls in the ordinary cruisers of 10,000 or 6,000 tons, armed with 8" or 6" guns, lightly armoured with 4" or 3" plates, horizontally protected with 8" plating as the usual types that in the last years have been built or designed by the leading navies of the world, like the British *Raleigh* class (9,000 tons, thirty-one knots) or *Emerald* class (76,000 tons, thirty-three knots); the U. S. *Omaha* class (7,500 tons, 33.75 knots); the new French *Bouvet* class (8,000 tons, thirty-six knots).

It is known that United States and French naval authorities have designed and proposed a 10,000-ton type. Average characteristics: speed thirty-five knots, armament 8" guns, armour 4" plates. Obviously these ships may menace the safety of maritime

communications and the surety of coastal towns, but they could not at all fight against capital ships.

#### 4. SPEED INSTEAD OF ARMOUR

Lord Fisher suggested to abandon armour, using only big guns and large horsepower for high speed and with such a fleet he promised to be victorious. The French Admiral Guépratte has said that speed is an invisible armour.

*Nihil sub sole novi*; let us remember that Italian unarmoured and fast battleships *Italia* and *Lepanto* (1876) were laid down after the heavy armoured battleships *Duilio* and *Dandolo* (1872).

Is it possible that after the era of dreadnaughts, super-dreadnaughts, and after the paroxysm of leviathan warships we shall return to the same ancient idea—*speed instead of armour*—in order to reduce the displacement for economical considerations?

Lord Fisher was appointed at the British Admiralty in 1905-10 and the first battlecruiser (*Invincible* class) was laid down; when he returned to the Admiralty in 1915 the two last ships of *Royal Sovereign* class were redesigned, becoming the two superbattlecruisers *Repulse* and *Renown*, and the light battlecruisers of the *Furious* class were laid down.

Rear Admiral Taylor, the gallant director of U. S. naval construction, in a very clear paper has written that the battle of Jutland has given a rude shock to opinions based on earlier actions (Doggerbank, Falkland) followed by the construction of the *Furious*, *Courageous*, and *Glorious*.

The partisan of speed observes that Admiral Beatty deserved his glory pushing his battlecruiser squadrons between the coast and the German fleet and occupying it until Jellicoe's battleship squadrons could arrive. Admiral Beatty had such possibility, thanks to the high speed of his fast cruisers. To obtain his brilliant object he sacrificed two obsolete cruisers (*Defense* and *Black Prince*) and three modern battlecruisers, *Queen Mary*, *Indefatigable*, and *Invincible*. These three battlecruisers blew up and sank in a few minutes; three ships of the *Furious* class could perhaps reach earlier the battlefield, but they could not be sunk more suddenly. And partisans of speed ask: what has been the utility of 2,500 tons or 3,500 tons of armoured plates with which the *Invincible* and the *Queen Mary* were respectively overloaded? It may be replied that battlecruisers have supported heavier

punishment than would have been considered possible and that many other ships of this class have survived, not losing their fighting efficiency. But the advocates of speed say that fast ships must be armed with superguns and that they must be used only at a long range.

Lord Fisher left the British Admiralty and died; *Furious* class has been abandoned instead of being perfected. It is known that actually British tacticians—even Lord Beatty—are no longer partisans of speed.

But principles may be different for a strong navy or a weak one; and the limitation of displacement is such a particular condition that it may impose peculiar and perhaps desperate solutions.

### 5. "Hood"

According to the idea of many naval men, the world war has demonstrated the value of armour protection, of guns and of speed; the result has been the latest ship *Hood*, a hybrid type between the battlecruiser and the battleship, which was redesigned and laid down just after the battle of Jutland. According to the very interesting paper by Sir Eustace Tennyson d' Eyncourt, the eminent director of British naval construction, the composition of *Hood's* weight may be as follows:

#### H. M. S. "Hood"

Hull (and fittings) .....	tons	14,900	( 36 %)
Armour and protection .....	tons	13,800	( 33.5%)
Machinery .....	tons	5,350	( 13 %)
Oil fuel .....	tons	1,200	( 3 %)
Equipment .....	tons	800	( 2 %)
Armament .....	tons	5,150	( 12.5%)
Displacement .....	tons	41,200	(100 %)
Oil fuel supplements .....	tons	2,800	
Displacement overloaded .....	tons	44,000	

The hull's weight includes the weight of decks and side-plating that contributes very materially to protection. Furthermore the hull's weight includes obviously the weight of Outfits or fittings as no other item is specified in the list of percentages given by Sir d' Eyncourt, besides "equipment" which means anchors,

chains, cables crew stores, etc. The item "Outfits," or fittings, refers to deck machinery, steering arrangements, drainage, and ventilating systems, furniture, sidelights, watertight doors, and all accessories of hull. In his interesting paper Sir d' Eyncourt has not specified the distribution of weights between "Steel Structures" and "Outfits," but by comparison with some actual ships it is possible to state that in very large warships the percentage of "Outfits" might be about 6%; then about 30% of the normal displacement may be attributed to the *Hood's* steel structure. The weight of the big gun houses' armour is included in the "Armour and protection."

It may be observed that the weight of machinery (tons 5,350) referred to the trial horsepower (150,000 horsepower) amounts to a rate of about twenty-eight horsepower per ton, that is to say, the relative weight is about eighty pounds per horsepower.

The normal weight of fuel, 1,200 tons, corresponds to about eighteen pounds per horsepower, that is to say, to about sixteen hours of running at full power.

#### 6. LIGHT MACHINERY ON "HOOD" TYPE

The same Eustace d' Eyncourt, speaking before the Institution of Petroleum Technologist, said that he could not concur in the opinion that the time has come to discard the battleship, but that he would consider it *a long step forward* if it became possible to perfect the combustion motor and so increase the power developed in its cylinder that its weight could be reduced proportionately to about that of an airplane motor. He alluded, I suppose, to gas turbine, but obviously the weight of a battleship's machinery cannot be reduced to two or three pounds per horsepower as for aero engines, because the weight of propellers, shafts, thrust bearings, transmissions, reduction gears, reversing apparatus, silencers, pipes, circulating systems, and other auxiliaries, cannot be neglected. I remember an installation of 2,400 horsepower, with very light gasoline motors, which amounted to about fifteen pounds per horsepower and I think that it will be a possibility at least in the near future, a greater reduction of the weight of marine motors under this value.

However, it is not useless to note that a further reduction in the weight of machinery under fifteen pounds per horsepower

could not have a great influence upon the displacement as it is clearly demonstrated in Table I, which has only indicative value.

Actually it is not yet possible to obtain 100,000 horsepower or more, with explosion marine motors, either at the rate of two pounds per horsepower (Case C) or at the rate of fifteen pounds per horsepower (Case B), but it is possible to have similar high power with light steam engines and boilers as on the *flotilla leaders* at the rate of thirty-four pounds per horsepower (Case A), that is to say, with a very reliable type of machinery. In this practical and suitable case with the same characteristics of armament, speed, radius of action, and protection, the displacement of the *Hood* might be reduced from 42,000 tons to 33,000 tons and that is surely a notable economy.

TABLE I

Type *Hood* —Reduction of displacement by reducing the weight of machinery

SPEED	32 KNOTS			
	<i>Hood</i> original	Case A .....	Case B Theoretical	Case C Theoretical
Type of ship.....				
Type of machinery.....		Light steam ma- chinery	Gasoline marine motors	Gasoline airplane motors
Relative weight of machinery..	lbs. 80	lbs. 36	lbs. 15	lbs. 2
Horsepower.....	H.P. 150,000	H.P. 143,000	H.P. 137,500	H.P. 134,000
WEIGHTS				
Armament tons	5,150	5,150	5,150	5,150
Hull and outfits (36%) tons	14,900	11,920	10,400	9,620
Armour and protection tons	13,800	11,940	10,900	10,330
Equipment tons	800	790	760	740
Machinery tons	5,350	2,170	920	120
Fuel tons	1,200	1,130	770	740
Displacement tons	41,200	33,100	28,300	26,700

Note—The weight of armour and protection has been varied as the power of two-thirds of the displacement.

From the deduction above (Table I) follows also that reducing notably the speed of the *Hood* type in order to reduce its horsepower and the weight of machinery, it is not possible, practically, to go under 27,000 tons.

Therefore a further reduction of displacement requires a reduction in the other items.

## 7. "FURIOUS" CLASS

Returning to the *Furious* and *Courageous* class we derive from Sir Tennyson d' Eyncourt's papers the following data:

H. M. S. *Courageous*

Hull (and fittings) .....	tons	8,560	( 46 %)
Armour and protection .....	tons	3,440	( 18.5%)
Machinery .....	tons	2,970	( 16 %)
Oil fuel .....	tons	750	( 4 %)
Armament .....	tons	2,230	( 12 %)
Equipment .....	tons	650	( 3.5%)
Displacement .....	tons	18,600	(100 %)
Oil fuel supplement .....	tons	2,500	
Displacement overloaded .....	tons	21,100	

Also in this case the hull weights include the weight of decks and side-plating that contributes very materially to protection, and the weights of "Outfits" or fittings. Sir d' Eyncourt has not specified the allotment of weights between "Steel Structures" and "Outfits" but comparing this class of cruisers with some actual ships it is possible to state that for medium displacement warships the percentage of "Outfits" might be about ten per cent and therefore about thirty-six per cent is left for "Steel Structures."

As *Courageous* is shorter than *Hood*, and as the ratio of length to depth is practically similar, the excess of percentage might be perhaps explained with unequal influence of the weight of protection plating, that, as said above, is included in the hull's weight. The weight of armoured places of big gun houses is included in the item "Armour and protection."

The weight of machinery, 2,970 tons, referred to the designed horsepower, 90,000 horsepower, amounts to a rate of about thirty horsepower per ton, that is to say, the relative weight per horsepower is about seventy-four pounds.

The normal weight of oil fuel, 750 tons, corresponds to about eighteen pounds per horsepower, that is to say, about sixteen hours of running at full power.



## 8. LIGHT MACHINERY ON "FURIOUS" CLASS

We may suppose to use also for the *Furious* class the steam machinery of the *flotilla leaders*, at a rate of thirty-four pounds per horsepower, that is to say, sixty-six horsepower per ton, instead of the actual type of machinery, maintaining the same characteristics of armament, speed, radius of action, and protection, the displacement results notably reduced from 18,600 tons to 16,000 tons.

TABLE II

Type *Furious*—Reduction of displacement by reducing the weight of machinery

SPEED		32 KNOTS	
Type of ship.....		<i>Courageous</i> original	Case D Light steam machinery
Weight of machinery per H.P....		lbs. H.P. 74	lbs. H.P. 34
Horsepower.....		H.P. 90,000	H.P. 87,800
Weights			
Armament	tons	2,230	2,230
Hull and outfits	tons	8,560	6,340
Armour and protection	tons	3,440	2,850
Machinery	tons	2,970	1,330
Oil fuel	tons	750	730
Equipment	tons	650	520
Displacement	tons	18,600	14,000

Let us consider the case of a 10,000-ton ship with the *Courageous*' armament; we have:

TABLE III

Type *Furious*—Further reduction of displacement by reducing armour and protection

DISPLACEMENT		10,000 TONS	
		Case E Unarmoured and unprotected ship	Case F Light protected ship
Length overall	ft.	700	600
Armament <i>Courageous</i>	tons	2,230	2,230
Hull and outfits	tons	4,500	4,300
Armour and protection	tons	Nothing	1,200
Equipment (4%)	tons	400	400
Machinery	tons	2,285	1,285
Oil fuel	tons	585	585
Displacement	tons	10,000	10,000
Horsepower	H.P.	150,000	85,000
Speed	knots	38	32

## 9. "EREBUS" TRANSFORMATIONS

A third type of warship that appeared, or rather was re-exhumed, during the war, is the monitor type, of which the most

advanced example is the *Erebus*, of 8,000 tons, at fourteen knots, mounting a pair of 15" guns. Following is the table of weights:

H. M. S <i>Erebus</i>			
Hull and outfits	tons	3,440	(43%)
Armour and protection	tons	2,080	(26%)
Equipment	tons	360	(4.5%)
Machinery	tons	720	(9%)
Fuel	tons	240	(3%)
Armament	tons	1,160	(19.5%)
Displacement	tons	8,000	(100%)

It is to be remembered that a portion of the weight of protection is incorporated in the steel structures and then it is included in the hull's weight.

With the same distribution of weights, but using a finer form suitable for greater speed and light steam machinery at the rate of sixty-six horsepower per ton, the same ship might carry about 47,000 horsepower reaching a speed higher than twenty-eight knots.

Let us now consider the same armament of *Erebus* upon a ship of 6,000 tons:

TABLE IV  
Type *Erebus*—Increase of speed by decreasing of armour and protection

DISPLACEMENT		6,000 TONS	
Type of Ship		Case G Unarmoured and un- protected cruiser	Case H Light protected cruiser
Length over all	ft.	700	600
Armament <i>Erebus</i>	tons	1,160	1,160
Hull and outfits	tons	2,700	2,580
Armour and protection	tons	Nothing	800
Equipment	tons	270	270
Machinery	tons	1,630	950
Oil fuel	tons	240	240
Displacement	tons	6,000	6,000
Horsepower	H.P.	107,000	62,000
Speed	knots	38	32
Fuel Capacity	tons	1,000	1,000

## 10. SUPERGUNS

The principle of long range battle requires not only high speed but the most powerful armament of long range weapons; today, that is to say, at least 18" guns.

As the weight of a two 18"-gun turret with its ammunition is not less than 1,200 tons *without armour*, and about 1,700 tons

including armored gunhouses, it is necessary to increase the weight allowed to armament. With the necessary allowance for secondary and aircraft armament, for torpedo tubes its machinery and accessories, torpedoes, hoists and so on, the weight of *unarmoured* and *unprotected* armament will amount at least to about 3,200 tons mounting four weapons of 18" and at least to 1,600 tons mounting only two weapons.

For ships of 10,000 tons and 6,000 tons mounting respectively four and two 18" guns the subdivision of weight may be:

TABLE V  
10,000-ton and 6,000-ton ships—superguns and speed instead of armour

DISPLACEMENT		10,000 TONS	6,000 TONS
Type of Ship		Case I Unarmoured and un- protected ship	Case J Unarmoured and un- protected cruiser
Length overall	ft.	600	600
Armament (18" guns)	tons	3,200	1,600
Hull and outfits	tons	4,300	2,580
Armour and protection	tons	Nothing	Nothing
Equipment	tons	400	270
Machinery	tons	1,600	1,150
Oil fuel	tons	500	400
Displacement	tons	10,000	6,000
Horsepower	H. P.	107,000	76,000
Speed	knots	34	34
Fuel capacity	tons	1,800	1,300

But if it is wanted to increase the speed nearly to forty knots it is necessary to reduce the weights of some other items.

## II. LIGHT HULLS OF CARGOBOATS

A further step might be the appliance of some courageous reduction of the hull's weight. Before making a comparison between the weights of hull and outfits of cargoboats and those of warships it is necessary to pay attention to the point that the former are referred to full load displacement and then for comparison purpose with warships it is necessary to suppose the latter overloaded at full capacity of fuel.

For instance in the case of the battlecruiser *Hood* the hull's percentage—thirty-six per cent referred to 41,200 tons normal load displacement, becomes about thirty-six per cent when referred to 66,000 tons overloaded displacement. Again, in the case of the cruiser *Courageous* the hull's percentage, forty-six per cent, referred to 18,600 tons normal load displacement,

becomes about forty-one per cent referred to 21,000 tons overloaded displacement.

As it has been stated, the hull's weights of *Hood* and *Courageous* include the weights of outfits.

It is well known that for cargoboats the weight of steel structures of the hull may be less than twenty per cent of displacement, outfits not included. In wartime, owing to the deficiency of steel, many standard ships have been designed in United States and in England. For instance:

TABLE VI  
Weights of hull and outfits in British standard cargoboats

BRITISH TYPES	g		n		a & b		e		c		d	
	tons	%	tons	%	tons	%	tons	%	tons	%	tons	%
Displacement	16,000	100	14,500	100	11,375	100	9,910	100	7,200	100	4,750	100
Deadweight	10,800	67.5	10,600	73	8,175	72	7,020	71	5,050	70	2,980	63
Lightweight	5,200	32.6	3,900	27	3,200	28	2,890	29	2,150	30	1,770	37
Machinery	1,350	8.5	600	4.2	570	5	570	5.8	460	6.6	420	8.7
Hull	3,200	20	2,650	18.3	2,225	19.5	1,920	19.2	1,390	19.4	1,110	23.3
Outfits	650	4	650	4.5	405	3.5	400	4	300	4.2	240	5
Length	ft. 450		ft. 411½		ft. 400		ft. 370		ft. 331		ft. 285	

It appears from above that hull and outfits of British standard cargoboats represent from twenty-three to twenty-eight per cent of displacement and that the weight of bare hull alone amounts from eighteen and three-tenths to twenty-three and three-tenths per cent of displacement. Moreover, during the war, Mr. Fisher-wood has designed ships of 10,000 tons D. W. for which the weight of the hull's steel structures were reduced even under seventeen per cent of displacement.

Oil tankers have greater strength and better subdivision than ordinary cargoboats; the steel structures of the former absorb a little higher percentage of displacement; for instance:

TABLE VII  
Weights of hull and outfits in oil tankers

TYPE	U. S. S. <i>Maumee</i>		Italian <i>Giove-Nettuno</i>		British Standard Type	
	tons	%	tons	%	tons	%
Displacement	15,000	100	10,760	100	11,400	100
Deadweight	10,000	67	7,226	67.2	8,000	70
Lightweight	5,000	33	3,534	32.8	3,400	30
Machinery			490	4.6	570	5
Hull			2,525	23.4	2,425	21.5
Outfits			1,519	4.8	405	3.5

It appears that the weight of "Hull and outfits" of the above named oil tankers amounts from twenty-five to twenty-eight and two-tenths per cent of displacement; the bare hull alone absorbing from twenty-one and five-tenths per cent to twenty-three and six-tenths per cent of displacement.

## 12. REDUCTION OF OUTFITS

We may at first deduce from Table VI that the weight of outfits in cargoboats is less than half that in warships of the same displacement. In the case of 10,000 ton and 6,000 ton ships the percentages of outfits are as high as ten per cent for warships instead of six per cent for cargoboats.

Also in the case of *Courageous* if such a reduction of percentage might be possible the displacement would be reduced, *coeteris paribus*, from 18,600 tons to 16,000 tons. This explains and supports the idea, that has been suggested many times by clever men, of greatly reducing auxiliaries, arrangements, furnitures, stores, comforts, etc., on warships with the aid if necessary, of a tender-ship or of a barrack-ship, in order to reduce the weight of "Outfits," of "Equipment" and then the displacement and the first cost of a man-of-war.

## 13. LIGHTENING OF STRUCTURES

For the *Furious* class (displacement 18,600 tons—21,100 tons, length 736 feet) the hull represents about thirty-six per cent referred to 18,600 tons corresponding to thirty-one and eight-tenths per cent referred to overloaded displacement. It is not known what percentage is absorbed by extraweights of protection and of bulkheads as they concur in strength of ships. By extraweights we mean the excess of weight applied for protection or subdivision over that strictly necessary for strength. It is probable that the extraweights of protection might represent at least five per cent and the extraweights of bulkheads two per cent; then twenty-four and eight-tenths per cent remains for residual and essential structures; this weight is higher than in a cargo-boat, but that is justified by difference in length.

In light cruisers the hull with outfits represents fifty-one per cent of normal displacement; the hull without outfits represents about

forty per cent which becomes thirty-four and five-tenths per cent if referred to overloaded displacement; deducing seven per cent for extraweights of protection and three per cent for extraweights of bulkheads, it remains twenty-four and five-tenths per cent as above.

If we start from the percentage of seventeen or nineteen per cent of displacement absorbed by a cargoboat's bare hull, it is necessary to consider the influence of the length. Our ordinary cargoboat is 450 or 400 feet long, while the fast warships, which we are talking about, are 600 or 700 feet long; the increased length required to increase the scantlings of fore-and-aft structures that absorb about two-thirds of the weight of cargoboat's bare hull; some calculations bring the percentage about twenty-three or twenty-four per cent displacement for lengthened hulls, with a convenient depth.

For warships of 10,000–12,000 tons or 6,000–7,200 tons, 700 to 650 feet long, we assume the percentage of twenty-three per cent, that becomes about twenty-eight per cent if referred to the normal displacement of 10,000 tons or of 6,000 tons.

### 19. BARE HULL SHIPS

With all the above deductions and assumptions we may answer the question on paragraph 3, about the possibilities of 10,000 ton or 6,000 ton warships:

TABLE VIII

Superguns and superspeed instead of armor. "Bare-hull" ships compared with very light protected type.

		BARE-HULL SHIPS (unarmoured and unprotected)		VERY LIGHTLY PROTECTED SHIPS	
		Case K	Case L	Case M	Case N
Normal displacement	tons	10,000	6,000	10,000	6,000
Length of hull	feet	700	700	650	650
Weights					
Hull steel structures (reduced)	tons	2,800	1,680	2,800	1,680
Hull's outfits (reduced)	tons	500	300	500	300
Equipment (reduced)	tons	350	210	350	210
Armour and protection	tons	Nothing	Nothing	1,000	700
Armament	tons	3,200	1,600	3,200	1,600
Machinery	tons	2,800	2,010	1,800	1,310
Oil fuel	tons	350	200	350	200
Normal Displacement	tons	10,000	6,000	10,000	6,000
Horsepower	H.P.	185,000	132,000	120,000	86,000
Speed	knots	40	140	35	35
Supplement of fuel oil	tons	2,000	1,200	2,000	1,200
Overloaded displacement	tons	12,000	7,200	12,000	7,200

Considering the weight allotted to armament in Table VIII, it appears that the 10,000-ton ships may be armed with four 18" guns in two double gun turrets and that the 6,000 ton ships may be armed with two 18" guns in one double gun turret, with unarmoured and unprotected gunhouses.

To the objection of a too-heavy armament upon a too-small displacement it may be answered that fifty years ago the Italian battleship *Duilio*, of 12,000 tons, was armed with four very big guns and that recent British monitors, even of 6,000 tons, have been armed with two big guns.

To the objections of the weakness presented at sea by the hull of the *Furious* class near the large well of a gun turret, it may be opposed that this failure was remedied by local reinforcements and it is not impossible to design some peculiar structural arrangement for local and general strength.

But a salient deduction is that the displacement of 10,000 tons and of 6,000 tons imply to use only two or one double gun turret and that shall oblige to develop the target practice of a division of two or four ships and the necessary communications between them in order to control the "Division fire."

#### 15. CONCLUSION. SUMMING UP

1. A further increase of speed for torpedo craft requires to lighten the relative weight per horsepower of machinery. In some cases it is suggested to use totally or partially gasoline motors. Awaiting gas turbines a provisory solution may be to combine light steam machinery for prolonged ordinary service until about thirty knots with gasoline motors to be added for short time extrapower from thirty to forty knots.

2. Transferring on battleships or large cruisers the reliable light steam machinery used on flotilla leaders, the former's displacement may be reduced notably. In this way with the same armament, the same speed of thirty-two knots, the same percentages of hull, outfits, and equipment and about the same characteristics of armours and protection, the displacement may be reduced for *Hood* type from 41,200 tons to 33,100 tons and for *Furious* type from 18,600 tons to 14,000 tons.

3. With the same armament and the same percentages of hull, outfits, equipment, as those of *Courageous* class, but with *neither*

*armour nor protection* and using light steam machinery it is possible to build a ship of 10,000 tons at thirty-eight knots' speed.

With the same armament, the same percentage of equipment of *Erebus* (monitor) but with *neither armour nor protection* and using light steam machinery with hull of suitable length and strength, it is possible to build a ship of 6,000 tons with thirty-eight knots' speed.

But as long range battle principle requires superguns, it is necessary to reduce other items of weights in order to mount 18" weapons.

4. The simple reduction of outfits' and equipments' weight to the percentages of cargoboats, accepting the principle of tender-ships attached to warships might reduce notably the displacement.

For instance, the displacement of *Courageous* might be reduced from 18,600 tons to about 16,000 tons without variation either in the types of machinery, armour, and protection, or in the percentage of steel structures of the hull.

5. Combining the lightening of hull and its outfit, of equipment, of steam machinery, and the complete suppression of any armour or protection, we came to what may be called "bare-hull" type of 10,000 tons and of 6,000 tons, at forty knots in each case, and armed with 18" guns, four or two, respectively, mounted in un-armoured two gun turret.

It may be opposed to this solution another one at thirty-five knots, with the same armament and displacement, but with a very light protection that might be incorporated in the hull, as Sir Philip Watts began to apply in his design of light cruisers (*Arethusa* class), extending the old principle of protective decks.

6. Closing these notes I confirm that I had only the object to examine from the point of view of the French fears, the technical possibilities of the small displacement allowed to Germany. I could not adhere to those fears because I think that actually Germany ought to desire a long period of peace; but, however, I repeat, rather than naval constructions, she would prefer to oppose "German air-power" to "British sea-power."



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## HIGHER NAVAL EDUCATION

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It is proposed here to set forth a comparison of the purposes, methods, courses of study, and organization of the foremost institutions for higher naval education. The information itself should be of interest, and it is possible that such a comparison may lead to useful deductions.

The sources of information are, where available, the text of the regulations or laws governing the institutions and descriptive articles from naval and general publications.

The wide variation in character is partly due to the fact that in no country does there exist for the Navy the same complete set of schools for professional study as often exist for the Army. The naval war colleges, therefore, must choose from a very wide list of subjects, and the choice and the emphasis often determine the character of the school. Another factor of variation is the national policy toward higher naval education and the number of officers available for detail. The foregoing factors largely determine the methods of instruction and the organization of the college, although the Italian *Scuola Navale di Guerra* is unique and constitutes a law unto itself.

In general the Japanese place the most emphasis upon higher naval education and have the most detailed and varied courses of study. In addition to their specialist schools they have the *Naval Higher College (Imperial Japanese Naval Academy)*, which has a course of two years. The German *Marine Akademie* also had a two-years' course, but all other courses are only one year.

In general this summary may be made regarding the character of these higher schools, that the Japanese and German are real

staff colleges, the French a modified staff college; the British have a separate staff school and a modified war college. The United States, except in technical, *material* subjects, makes no provision for training junior officers, but concentrates all effort upon the training of officers of high rank for higher command.

The aims of the various colleges afford an interesting comparison. The *Service Regulations* of the *Marine Akademie* describes as the object of that institution: "To give naval officers an opportunity to continue their scientific education and thus to fit themselves for higher positions in the naval service."

The Japanese Regulations authorizing the *Naval Higher College* states as the mission of the school:

"The Naval Academy shall give instruction to naval officers and engineers in higher courses in science and art."

The decree reorganizing the *École Supérieure de la Marine* says:

"The object of the school is to instruct the greatest possible number of officers of the Navy in the doctrine of war as deduced from the continuous study of problems of naval war in order to realize in our fleet a complete unity of views of command."

The Regulations of the *Italian Naval War School* states:

"The principal object of the Naval War School shall be to cultivate and fix naval thought upon our preparation for war by the aid of the widest intellectual contribution."

At the *Royal Naval War College* the object of the senior officers' war course is to fit junior captains for commands afloat, although senior commanders, senior captains, and even flag officers occasionally attend.

The *Naval War College* at Newport was established by General Order No. 325 of October 6, 1884, which described the new school as "A college for an advanced course of professional study for naval officers." The Secretary of the Navy at the time, in a letter to the Senate, gave a closer definition:

"The college is intended to complete the curriculum by adding, to an extent never heretofore undertaken, the study of naval warfare and international law and cognate branches."

Since the time of its foundation, the mission of the *United States Naval War College* has been defined with greater precision by its directors and it is to the addresses of its presidents that one must turn to determine its present policy.

Commander Goodrich, in his closing address of September 15, 1897, stated:

"The College distinctly disclaimed the position of teacher and only claimed that of a fellow-student. This stand, I think, was consistently taken and has been as consistently adhered to."

Admiral Sims expressed the purpose thus:

"The primary object of the Naval War College is to study the principles of warfare . . . to develop the practical application of these principles to war on the sea under modern conditions and then to train our minds to a high degree of precision and rapidity of decision in the correct application of these principles."

This policy it is which makes our *Naval War College* as distinct in aim as the Italian is in form and method. Despite the prestige gained by Admiral Mahan and inherited by the War College, despite the early lecture system the institution has resolutely and consistently refused to undertake the rôle of instruction or don the mantle of authority. In his address to the class of June, 1919, Admiral Sims reiterated once more this inflexible tradition in these words:

"The College is in effect part of the fleet and exists solely for the fleet.

"The students bring to the College their practical fleet knowledge and experience. They are asked to consider this practical knowledge and experience in connection with the principles of warfare . . . you will carry these principles back to the fleet."

This policy has repeatedly been, and is at present once more, the subject of discussion.

Therefore, in considering the aims of the various war colleges, we may make the following comparisons: the German, British and Japanese are alike in that they profess to instruct officers for higher command. The American and French resemble each other in their avowed purpose of developing a doctrine of war. The Italian purpose is the exchange of ideas and the study of current naval developments and thought.

It is interesting to observe how variously the different nations go about their tasks. If we keep in mind that nowhere does a complete set of schools exist, the various expedients adopted for covering a very wide field with limited facilities show curious contrasts.

The adjoining table shows in parallel columns the different subjects treated.

GERMANY	JAPAN	FRANCE	GREAT BRITAIN	UNITED STATES.
Naval Warfare	Strategy Tactics		Strategy Tactics	Strategy Tactics
Naval History	Naval History	Naval History	Naval History	
				Scouting and Screening
General Staff	Staff  Administration Organization Logistics	Staff Foreign Navies French Navy Administration	Staff	Command and Policy  Logistics <sup>1</sup>
	Fortification	Coast Defense	Coast Defense	
International Law	International Law	International Law	International Law	International Law
Ordnance Milit. Tactics Hydraulics Hygiene  Geography Oceanography Astronomy Navigation Electricity Naval Constr. Polit. Science Engines Submarines Torpedoes	Ordnance Milit. Tactics Mechanics <sup>2</sup> Hygiene Physics Chemistry Geography Oceanography Astronomy <sup>2</sup> Navigation Electricity <sup>2</sup> Naval Constr. Polit. Science <sup>2</sup> Engines <sup>2</sup> Submarines <sup>2</sup> Torpedoes <sup>2</sup>	Ordnance Milit. Tactics  Geography  Electricity Naval Constr. <sup>2</sup> Polit. Science Engines Submarines Torpedoes Aeronautics	    Electricity Naval Constr.	
General History Languages Mathematics Natural History	Languages Mathematics			

<sup>1</sup> Included in Strategy.

<sup>2</sup> More detailed than indicated here.

It will be seen that the German and Japanese are the most comprehensive. Both require two years as against one year for all others. The Japanese is even more complete and detailed than appears in the table where subjects are grouped in order to show parallelism with other schools. These two are practically staff colleges for junior officers. The French school also aims at staff training but is intermediate in type. The British are now conducting a separate staff course for junior officers at the *Royal Naval War College*, while its war course resembles our own except in methods of instruction.

Our own solution, if far from perfect, due to conditions imposed by the policy of the nation, is almost entirely a course for

junior officers given of necessity to senior officers. It has the virtue of a frank recognition that the whole ground cannot be covered in one year and a firm adherence to the subjects regarded as essential. Since the entire commissioned personnel cannot be passed through the school, the War College courageously continues to confine to senior officers a course the large part of which would be appropriate for lieutenant-commanders.

All war colleges study international law, and all, in one form or another and with varying degrees of emphasis, study strategy and tactics. Only in the United States are scouting and screening and command studied as separate subjects, and nowhere else are naval history, naval construction, coast defense, staff duties or electricity neglected.

The method of instruction also at the *United States Naval War College* differs radically from all others. With us alone the lecture plays no part. Such lectures as are given are connected with no course of study and are incidental, except in international law. At Newport we rely entirely upon reading and the applicatory system as expressed in the solution of problems, their maneuver on board and chart, and in the writing of theses. All others, including the British, which most closely resembles our own, depend largely upon lectures.

To a certain extent this explains the composition of the different staffs. The Japanese have thirteen Naval officers and fifteen civilian professors, being in this respect similar to the German *Marine Akademie*. The *École Supérieure de la Marine* has seven Naval officers, two Army officers (for coast defense and aeronautics) and three civilian professors (for Naval history, Naval geography and international law). The British College has a staff of nine Naval officers, one Marine officer, and a number of professors. At our Naval War College we have at present on the staff, as instructors, nine Naval officers, one Marine officer, one Army officer and one civilian professor; three civilian assistants are also provided for and one is now serving.

The Italian *Scuola Navale di Guerra* is described separately because in practically no respect does it afford any basis for comparison with any other. There is no instructional staff; no prescribed course of study, and, although the administrative work is done in the office of the Director, the Chief of the General

Staff at Rome, the meetings are held at no fixed place, but as opportunity offers, whether at a Naval station or on board a ship. Lists of topics for competitive essays are compiled and the best results are read as lectures before the conferences and discussed. Of these lectures and comments the best—except those of a confidential nature—are printed in the *Revista Marittima*, the official organ of the school.

The disadvantages of this organization are self-evident; but there are also very real benefits as the quality of the *Revista Marittima* shows. Not only is a great deal of instruction involved in the preparation of these essays, but the best results are made available for all officers.

Of the advantages over our *Naval War College* enjoyed by other schools, there are few that can be adopted by us simply because we have not the officer personnel available for either a two-years' course or to permit the establishment of a staff course. What can be done to extend the influence of the War College throughout the fleet is pretty effectually accomplished by the correspondence course and the mailing list of the War College publications. A slight increase in the staff, particularly the development of the indoctrinated civilian force for compiling and editing the fruits of the labors of the students and staff would probably serve to raise the average of information throughout the fleet.

Undoubtedly, with the present critical shortage of commissioned personnel there is no immediate prospect that the approved recommendations of the board of the Bureau of Navigation for a complete and progressive series of schools will be put into effect, and until that is done it is the part of wisdom for the *Naval War College* to reject the allurements of lectures, to decline the luxury of civilian professors and even to continue to disregard the importance of investigations in Naval history as a source for the formulation of doctrine, and to keep firmly to the narrow limits of the present curriculum in order that the vital professional subjects may be covered as thoroughly as possible.

In short the policy of our *Naval War College* is contingent upon the policy of the country toward Naval personnel, and as long as the country continues to develop its Naval materiel without any rational parallel emphasis upon the quality and quantity of its

personnel, so long will the efficiency of the Navy decrease. Time does not stand still. New developments in warfare continue to exert their influences upon the ratio between matériel and personnel on the one hand, and upon the ratio of quantity and quality on the other.

If the developments of science made a War College necessary in 1884, the myriad subsequent developments much more imperatively demand that the many subjects of necessity neglected by that school today be provided for. The country is averse to facing the expense of increasing the quantity of personnel, but it would take only pride and pleasure in any increase in its quality and efficiency. There is a point beyond which any increase in matériel no longer strengthens but weakens a Navy, and the question ought to be discussed whether the fleet would be made less effective or more so if certain ships were scrapped or laid up in order that the recommendations of the Bureau of Navigation may be carried out and the quality of leadership improved.





SUPT.

SHOP SUPT.

LINES.  
GROUNDS.  
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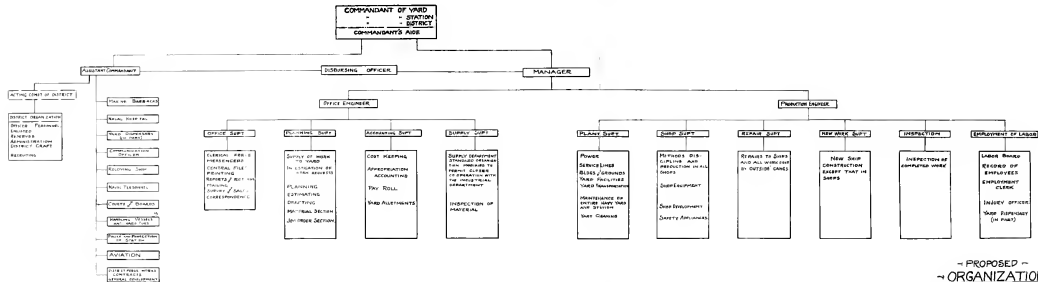
METHODS, DIS-  
CIPLINE AND  
PRODUCTION IN ALL  
SHOPS.

SHOP EQUIPMENT.

SHOP DEVELOPMENT.

SAFETY APPLIANCES.





~ PROPOSED ~  
~ ORGANIZATION ~  
NAVY YARD, CHARLESTON, S.C.  
NOV 15, 1921

*W. H. H. H.*  
W. H. H. H.  
GENERAL OFFICER



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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

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## INDUSTRIAL ORGANIZATION OF NAVY YARDS

BY COMMANDER C. W. FISHER (CC), U. S. N.

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1. On November 28, 1921, a conference of commandants and managers will take place at the Navy Department, Washington, D. C., for the purpose of discussing, and if possible, of establishing a standard organization for navy yards.

2. This conference is the result of two General Orders issued by the Navy Department, one of which established an office in the department under the Assistant Secretary of the Navy, for controlling the general administration of navy yards, while the other set forth the general principles upon which the organization of the navy yards themselves should be based. The following notes while they do not strictly conform to the requirements of these orders are nevertheless based upon the principles enunciated in them, which principles, to my mind, afford a sound logical basis for obtaining much better results than have been possible in the past.

3. For convenience the two General Orders referred to are quoted in part below.

GENERAL ORDER No. 68

September 6, 1921.

### DEPARTMENT ADMINISTRATION OF NAVY YARDS AND NAVAL STATIONS

The departmental administration of navy yards and naval stations will be conducted under the immediate supervision of the Assistant Secretary of the Navy.

Specifically, the following activities are included within the purview of this order, and all conflicting regulations shall be changed accordingly:

- (a) Administration, organization and management.
- (b) Civilian personnel and labor, and all matters pertaining thereto, including the maintenance of high morale.
- (c) Recommendations for complements of officers.

NOTE: This article was written in November, 1921.

- (d) Buildings, grounds, shops, power plants, service lines and rolling stock.
  - (e) Plants, machine tools, equipment, and appliances.
  - (f) Manufacturers and manufacturing processes.
  - (g) Cost analysis in connection with the determination of economy and efficiency.
  - (h) Co-ordinating the assignment of available funds, co-ordinating the assignment of work on vessels made available for work at yards and stations by the Chief of Naval Operations, and co-ordinating other work assigned to yards and stations in accordance with their abilities, with a view of maintaining stable labor conditions, consistent with the military needs of the fleet.
  - (i) Inspections of navy yards and naval stations.
  - (j) Co-ordinating the above activities and functions with the war plans and fleet operating schedules.
- (3) The actual assignment to yards of vessels; the availability of vessels for repairs; the priority of work on vessels; the designs and details of work, repairs, and alterations; and the allotment of funds, will be determined as heretofore by the bureaus and offices responsible therefor under law and regulations.

## GENERAL ORDER No. 53

June 16, 1921.

## ORGANIZATION AND ADMINISTRATION OF NAVY YARDS AND NAVAL STATIONS

(1) Navy yards and stations exist for the service of the fleet, and chiefly for those services to vessels, of repair, docking, revictualing, and improvement, that are beyond the capacity of the ship's force to accomplish.

(2) The officer ordered to command a navy yard or station is the commandant. He is the representative of the Navy Department in all matters within the limits of his command, and is responsible to the department for all business transacted therein. As commanding officer he shall exercise entire control over every part of the yard or station, and shall have full authority over all persons, civil and naval, employed therein or attached thereto.

(3) The commandant shall execute the department's policies issued to him from time to time so far as they apply to his command, together with such orders and instructions as he may receive from proper authorities.

(4) It is the duty of the commandant—

- (a) To base his plans, methods, decisions, and recommendations upon such approved plans for national defense as may be furnished him from time to time by the department.
- (b) To accomplish the maximum service to the fleet.
- (c) To lead the men of his command, whether civil or naval, through sympathetic consideration of their aims and of their needs.

- (d) To establish, to maintain, and to enhance, by every practicable means, the spirit of his subordinates, civil as well as naval.
- (e) To restrict expenditures to the limitations of funds made available for expenditure within his command.
- (f) To secure the performance of work in accordance with priority established by the department.
- (g) To prevent and to avoid waste, whether of funds, of time, or of facilities.
- (h) To simplify the organization and methods of administration by concentration of shops, drafting rooms, storehouses, and other facilities to the end that as large a proportion as possible of the total navy yard expenditures shall be devoted to productive labor on approved projects.
- (i) To co-operate in every way possible with the Navy Department and with the commanding officers of the vessels at the yard.
- (j) To co-ordinate the work of the various yard activities, to require the faithful and efficient performance of duty by all persons employed within his command, and to enforce within his command the strict observance of law and of regulations.
- (k) To exercise a proper supervision over all matters affecting general health, safety, and welfare.
- (l) To make recommendations to the Secretary of the Navy in regard to development of the yard or station.
- (m) To keep the department informed as to the progress of work and the general condition of the command.
- (n) To give the department the benefit of his experience and judgment to assist it in formulating its policies.

(5) It is the intention of these regulations that the commandant, as the representative of the department, shall, in the exercise of his duties and in accordance with the department's policies and instructions, make decisions to relieve the department of detail and to reduce correspondence.

The administration of navy yards and stations is directly under the commandants. The bureaus of the department have no cognizance over this administration, but the commandants are responsible for the faithful execution of the bureaus' orders.

(6) The commandant has power to administer punishment in accordance with the regulations of the navy and of the civil service, upon any person under his command, who commits any crime or misdemeanor or whose conduct otherwise warrants it.

(7) In the absence of the commandant the senior officer present, eligible by law to exercise command ashore, shall assume command of the station.

(8) The internal organization of any navy yard shall be based upon the service that yard is expected to render to the fleet in time of war. The relation between the usual peace-time conditions and those that may be met successfully in time of emergency as well as peculiar local conditions, such as facilities available and character of work and of personnel, should

determine all decisions made by the commandant in framing the organization of the yard and in modifying the duties charged to any one of his subordinates beyond those hereinafter set forth, which are prescribed as the standard practice for navy yards. The commandant should arrange the internal organization of his command so that ordinary, usual, and smoothly running affairs of the command be not referred to him; to the end that the overcoming of difficulties, adjustment of differences of opinion between subordinates, and troubles, together with the needs and methods of their yards in a large way, shall furnish practically the entire demand upon the time of the commandant.

(9) The principal aids to the commandant are the captain of the yard, whose duties are set forth in Navy Regulations, and the manager, who shall be an officer of experience and demonstrated capacity in the direction of industrial activities.

(10) The commandant shall place the industrial activities of the yard, including the labor force, all facilities for productive shops and offices, the supervision of personnel and facilities of the Industrial, Public Works, and Accounting Departments in the hands of an experienced officer, who shall be called the manager. Unless some officer is specifically detailed for duty as manager, by orders of the Navy Department, the commandant shall select one from his subordinates and assign him to this duty.

(11) The duties of the manager are as follows:

- (a) To support the policy and to execute the orders of the commandant.
- (b) To assist the commandant in all ways practicable in the execution of his duties as herein set forth.
- (c) To co-ordinate and be responsible to the commandant for the activities placed directly under his charge.
- (d) To pass upon requests for work from ships and to decide such requests in accordance with general instructions from the commandant.

4. Before attempting to outline a navy yard organization based upon the principles laid down in General Order No. 53, it is well to consider the underlying purpose of this order and the limitations involved in the fact that the organization must be a naval organization, and therefore semi-military in character, officered by men who have had military training rather than industrial training. If the object of General Order No. 53 is really to establish and maintain an economical, businesslike, and efficient organization for navy yards (which is sorely needed, especially at this time of reduced appropriations) several difficult, if not unpleasant, facts and conditions must be faced, before a definite scheme is to be put into being. Among these are the following:



- (a) Navy yards can never hope to obtain maximum efficiency, due to the fact that naval officers are not ordinarily ordered to navy yards because they have proved themselves to be specially fitted for navy yard work. This of course, applies more particularly to the junior officers and those of the line and sea-going corps. Furthermore, the necessity of sending officers to sea after a short tour of duty of two or three years at navy yards has a very detrimental effect upon that continuity of policy which has such an important bearing upon success in any administrative or executive work.

For the so-called industrial portion of navy yard work, very few naval officers have any special aptitude. Still fewer are those who could compete with commercial men whose principal training has been along lines of industrial management. Navy yard work, and especially industrial work in navy yards is (except for a few officers in the non-seagoing corps) a side issue in their life work of training for combat at sea. Control of a civilian personnel requires to a certain extent at least, different personal characteristics and habits of thought from control of a military enlisted personnel.

- (b) Increased efficiency, for which we are all striving, means doing *more for the same money*, or to put it in another way (particularly applicable to present conditions) doing nearly as much for half the money. Considering labor alone, to the exclusion of material, it means that at least the same amount of work as is now being performed must be accomplished by fewer men, both officers and civilians. If no reduction in officer and civilian personnel is made at navy yards, then there is no increase in efficiency so far as labor is concerned, unless a greater output is obtained. It is therefore apparent that if a reorganization is to be effective and the same amount of work is to be handled there will inevitably result a reduction in the number of officers on duty at navy yards. Self-deception in this regard has been the rule in the past in connection with previous attempts at navy yard reorganization. Giving an officer or an employee another job in the navy yard

does not reduce the cost of running the yard no matter what the accounting system may say.

- (c) Excessive paternalism in the matter of leave, holidays, retirement, pensions, etc., has a marked effect in increasing the total cost of work in navy yards. It is proper that the Government should lead the way in improving the condition of the worker, but there is no reason why the Government need be so far in advance of general conditions as to place unwarranted burdens upon the tax payer.
- (d) Political, departmental, and Civil Service interference with the choosing of employees, their retention, re-rating and discharge, operates directly to undermine the commandant's and manager's authority and prestige, and hence their control of the working force. Few if any yards with which I am acquainted do not feel hampered from one or all of these three causes. During the past fifteen years the Civil Service rules have become increasingly restrictive, and have consistently withdrawn control of the employment of labor from the commandant and placed it in the hands of the Civil Service Commission. Red tape is correspondingly increased. Yet after fifteen years' service in navy yards I fail to see that the employee, collectively or individually, has benefitted in the least. Commandants or heads of departments feel hampered by the Civil Service rules, and the mere fact that they *feel* hampered (whether they are *actually* hampered or not) prevents that prompt reward for well doing and equally prompt discipline for ill doing that forms the backbone of an efficient organization.
- (e) Unequal authority granted to commandants tends to produce useless paper work and interferes with the efficient conduct of navy yards. A commandant may employ fifty additional mechanics at \$5.00 a day, but he may not employ a single additional clerk at \$3.28 a day without authority from Washington. A commandant may undertake a repair job on a ship amounting to \$3,000, but he is forbidden to promote a draftsman to a forty-eight-cent increase without authority from Washington. A commandant may send a tug to carry an officer on duty to a point 100 miles away, at a cost of several hundred dollars,

but he may not issue orders so that the officer could travel by railroad at a cost of \$5.00, without having such orders approved by the Bureau of Navigation. Some of these conditions, of which only a few have been referred to, are due to restrictive laws, which should be repealed; others are the outgrowth of custom. In any event, to obtain maximum efficiency the commandant should be given the authority which is contemplated in General Order No. 53 in *all* matters under his control, and he should be held responsible for results instead of being restricted in authority.

- (f) A further difficulty in working out a logical organization is that of the military questions of relative rank and precedence and its side issues, such as the right to occupancy of navy yard quarters. These questions should have no part in determining the most efficient type of navy yard organization; but they do nevertheless exert a most powerful influence. In fact, a glance at the recent charts of the organization of the various navy yards will show that great consideration has been given to such matters.

5. I have discussed above some of the conditions that form obstacles to establishing a thoroughly efficient navy yard organization. Summarizing, these are:

- (a) Naval officers are not trained industrial administrators or executives and are not available for long tours of duty.
- (b) Difficulty in reducing the number of officers on shore duty.
- (c) Excessive gratuities to employees.
- (d) Outside interference with employment of labor.
- (e) Authority commensurate with responsibility not granted to commandants.
- (f) Some difficulties due to rank.

Some of these conditions can be remedied; others cannot be remedied. They, and others similar to them may perhaps be covered by the general statement that the maximum financial and industrial efficiency can never be obtained in any navy organization because it must be run by a governmental military organization,—the navy. However, by

analyzing and facing such conditions, ways may be found to improve them and they should be constantly kept in mind with that end in view.

#### 6. Titles of Officials

- (a) The consolidation or amalgamation of the present working departments and divisions of the navy yards is essential to efficiency, and as a very important aid to accomplishing such complete amalgamation I strongly advocate doing away completely with the present titles of Head of Department or Head of Division. Such titles perpetuate the old navy yard organization whereby each bureau of the Navy Department had its representative at the navy yard, each having under his control a more or less complete small industrial plant. The wasteful duplication of effort, and the duplication of similar facilities and shops involved in this scheme led, about fourteen years ago, to the first steps towards its abandonment, namely, the abolition of the Equipment Department at navy yards, and the abolition of the Bureau of Equipment in the Navy Department. This was followed by the abolition of the Ordnance Department at navy yards and the establishment of the Hull Division and the Machinery Division for performing all ship work. In an effort to avoid the complications which resulted from the fact that the Navy Department was organized into bureaus—while the navy yards were then organized partly into divisions whose duties brought them into relation with more than one bureau—the Navy Regulations were changed to provide that the commandant is the only representative of the bureaus in a navy yard. How this has actually worked is familiar to all. The bureau representatives still exist *de facto* if not *de jure*. The *construction* officer represents the Bureau of *Construction* and Repair, the *engineer* officer represents the Bureau of *Engineering*, the *supply* officer represents the Bureau of *Supplies* and Accounts (note the similarity of names), and the public works officer represents the Bureau of Yards and Docks. Ask any one how difficult it is, even after the lapse of many years, to

train a clerk that a C. and R. item of work on piping has nothing to do with the construction officer.

- (b) To attain the thorough and complete amalgamation of like duties, which is necessary in any efficient organization, the psychological effect of such apparent trifles cannot be ignored, the more so because they have helped to bar the way to progress during past years.
- (c) The selection of titles so that they may be simple, descriptive and at the same time avoid the above difficulties is not easy. The following suggestions are offered:

*Commandant*: Retain this title for the official in full military command of the navy yard, station and district.

*Department*: One of the two groups into which all of the commandant's activities are divided, as indicated in General Order No.53. There will be only two departments, namely, military and industrial.

*Assistant Commandant (Captain of the Yard)*: The title of the official who administers the Military Department. This title is recommended to take the place of captain of the yard, which is too restrictive for the enlarged duties vested in this official.

*General Manager*: The title of the official who administers the Industrial Department.

*Division*: One of the two groups into which the Industrial Department (under the general manager) is divided. These two groups are the Office Division and the Production Division.

*Office Manager (Or Office Engineer)*: The official charged with the administration of the Office Division.

*Production Manager (Or Production Engineer)*: The official charged with the administration of the Production Division.

*Section*: One of the several groups under the office engineer and the production engineer, such as Planning Section, Ship Repair Section, etc.

*Superintendent*: The official in charge of a section, as planning superintendent, shop superintendent, etc.

7. To carry out the ideas expressed in the preceding paragraph, all officers should be simply ordered to report to the commandant "for duty," instead of being ordered, as at present, for duty "as engineer officer" and the like.

#### COMMANDANT'S FUNCTIONS

(a) The commandant of the navy yard is also the commandant of the station and the commandant of the district. In combining these three functions in one individual the duties imposed thereby may be divided into two broad groups which for lack of better terms may be called Military and Industrial. In some instances it is not easy to determine whether a given activity is primarily industrial or military, and in deciding this point three criteria have been used:

- (1) If the industrial portion of the yard were discontinued and the activity in question was still considered necessary as a military requirement, the activity has been classed as military.
- (2) The Industrial Department, that is, the activities grouped under the manager, has been considered as the *producer*, and any activity which under ordinary conditions would be primarily the *customer* of such producing department, rather than a unit of production itself, has been classed as military.
- (3) The manager should have as nearly as possible the same authority, power, and responsibility as are ordinarily vested in the general manager of a large commercial shipbuilding plant.

(b) On the above basis the military activities under the commandant of the yard, station and district, of which the assistant commandant should be the executive and the direct representative of the commandant, are the following:

Courts and Boards,  
Handling vessels in commission at the yard,  
Dispensary and yard surgeon (in part),  
Chaplain, yard recreation center,  
Enlisted personnel officer; welfare work,  
Policing and protection of yard and station,

Marine Barracks,  
Communication Office,  
Aviation,  
Receiving Ship,  
Administration of district affairs and district public works,  
Naval Hospital,  
Recruiting, etc.

(c) On the same basis the following activities should be assigned to the manager as comprising the industrial portion of the commandant's functions:

Purchase, receipt and issuing of all stores and material,  
Operation of all shops and productive units,  
Maintenance and repair of all the industrial department plant and equipment,  
Yard transportation,  
Industrial accounting,  
Employment of labor,  
Inspection of work.

*Note*—Dependent upon the size of the yard and the volume of district work, it may be necessary to have a separate officer perform the function of assistant commandant and another to handle district matters. This arrangement, however, does not affect the principle of the organization herein outlined.

(d) The above outline means that the manager should control the Hull Division, Machinery Division, Supply Department, Accounting Office, employment of labor, and Public Works Department (except for district and contract work and general schemes for yard and district development).

(e) The assistant commandant should control all other matters under the cognizance of the commandant.

#### OFFICE ORGANIZATION

(f) Before taking up in detail the organization of the two executive branches referred to above, it is well to outline briefly the principles which should obtain in the office of the commandant, assistant commandant, and manager, as regards handling correspondence, etc. The consolidation of files and correspondence is

highly desirable, but this consolidation should be so arranged that there should be no difficulty in separating the correspondence concerning individual activities in case the yard grows to such an extent as to render necessary an expansion involving the splitting off of such activity from the main stem of the organization. This simply means that the indexing and filing system should be intelligently worked out.

(g) *The Commandant's Office*, supervised by a chief clerk (who should be the commandant's confidential clerk and secretary), should exercise the function of a clearing house. All incoming correspondence should be opened here and given its primary routing to the assistant commandant or manager. This office should not attempt detailed routing or detail instructions regarding the handling of correspondence except in unusual and special cases which warrant such action.

(h) This office should also receive and arrange all outgoing mail which requires the commandant's signature. Beyond one assistant to the chief clerk and perhaps one stenographer for special work, there should be no special office force assigned to this office, but any additional clerical work required should be obtained from the central office.

(i) *Assistant Commandant's Office*: The assistant commandant should have a supervisory clerk or, if the volume and importance of work requires it a chief clerk to handle correspondence and act as secretary to the assistant commandant. After mail is received from the commandant's office it should be indexed, given the detail routing necessary, the required number of copies prepared, and the papers sent on their way.

(j) *Manager's Office*: A chief clerk with suitable assistants should perform relatively the same duties as outlined above for the assistant commandant.

(k) If at all practicable, it is strongly recommended that these three clerks be *not* placed in the same room as their duties are in no way connected.

(l) The central files and correspondence office should be supervised by either the chief clerk to the commandant, or preferably, the chief clerk of the Industrial Department. In this office should be concentrated all typists, and stenographers, and the office should furnish such clerical assistance as is needed by



the commandant, assistant commandant, and the manager. As the yard grows, it will be necessary to separate the industrial files from the military files and establish corresponding separate office forces.

#### ASSISTANT COMMANDANT

(m) No discussion is here given of the detail organization of this branch beyond emphasizing the evident desirability of concentrating in one office and in the hands of a direct representative of the commandant, all of the now dissociated and independent activities, which the commandant is called upon to administer. Such concentration will provide a method and an office through which such matters as are now handled by the commandant, may pass, and be acted upon expeditiously, even in the absence of the commandant, by an officer who is by virtue of his position, thoroughly familiar with the policy of the commandant and is authorized by him to act in accordance with that policy. Such concentration is by no means meant to restrict the present custom of direct correspondence with the Navy Department and its bureaus on the part of certain activities (for example, Naval Hospital), but will place in one office general matters of administration in such a way that conflict of policies will be avoided and possibility of economies will be increased.

#### MANAGER

(n) There are many types of industrial organizations, each particularly suited to its own class of work. All organizations depend to a certain extent upon personality. With the constantly changing personnel of navy yards such dependence on personality must be reduced to a minimum or else the organization must be constantly changed to suit the new officers. It must be further realized that generally speaking there will be found on duty at navy yards comparatively few officers who are keenly interested in industrial work or who have any special talent for it. At a small yard it is necessary to establish an organization such that the absence of one or more of the principal industrial officers will not tend to break up the smooth running of the department. At the same time the organization should be capable of being expanded to cover the needs of the yard in war time and

to accommodate normal growth and expansion. For these reasons the manager's functions are divided into two main divisions, the Office Division and the Production Division.

#### OFFICE DIVISION

(o) This includes all correspondence, work requests, purchase, custody and issue of supplies and material, preparation of work, planning, estimating, drafting, issuing job orders, inspection of material, and the reports incident to the prosecution and completion of work.

#### PRODUCTION DIVISION

(p) This comprises the operation of the shops and outside work forces, new construction, ship repairs, maintenance of plant, furnishing power, and in general, the actual productive work required to transform the plans of the office into a completed job. Outside work includes all matters pertaining to employment of labor, except those relating to the office force itself. (The clerical work of the employment office may be placed under the inside superintendent.)

#### DISBURSING OFFICE

(q) The manager also should have certain authority in connection with the Disbursing Office of the yard, that is, so far as regards the paying off of civilian employees. Aside from this, however, the disbursing officer of the yard should come under the control of the assistant commandant.

(r) The manager thus, like the commandant, has two principal assistants or executives, namely, office engineer and production engineer.

#### OFFICE ENGINEER

(s) The office engineer should handle the following groups or sections:

- Correspondence,
- Accounting,
- Material and supply,
- Planning and estimating,
- Material inspection,
- Surveys.

(t) The above outline of the functions of the office engineer includes the present Supply Department. The supply officers' organization should remain intact except that much more intimate relations should be established between it and the Industrial Department of which it should be an integral part, and consolidation and reduction of offices should be made where possible. It is especially necessary that information regarding purchase, receipt and the presence in store of all items of material used by the Industrial Department should be available for use by the Industrial Department without the lost motion that at present exists.

(u) Each of the sections assigned to the office engineer need not be supervised by a commissioned officer. The number of such officers required will depend upon the volume of work and size of yard.

#### PRODUCTION ENGINEER

(v) The production engineer should control the following groups and sections:

Plant, including all structures, machinery and facilities necessary for the operation of the Industrial Department,

Administration of shops,

Ship repair work,

Shipbuilding work,

Yard transportation,

Inspection of finished jobs; and handling and discipline of all civil employees, except those of the office force.

(w) The various sections assigned to the production engineer need not be each supervised by a commissioned officer,—this, as in the case of the inside superintendent, depends upon the size of the yard and the volume of work.

#### PUBLIC WORKS

(aa) It will be noted that the functions of the present Public Works Department have been split, those pertaining to the district outside of the yard, contract work, and general development, being assigned to the assistant commandant, while those which have to do with the repair, maintenance, and operation of the Industrial Department are vested in the manager. This means the absorption of the present Department of Public Works, and

the merging of the present public works office force with those of the assistant commandant and the manager, the merging of the public works drafting force with that of the Industrial Department, and the absorption in the shops under the production engineer of the laborers and mechanics now carried on the public works rolls.

#### SUPPLY DEPARTMENT

(bb) The Supply Department as well as the Public Works Department has been, in the above organization, absorbed by the Industrial Department. This does not involve the necessity for breaking up the standard organization for Supply Departments at navy yards recently issued by the Bureau of Supplies and Accounts, but may involve slight modifications of this organization in order that the best interests of the yard and station may be conserved. It has been frequently claimed that issues of material direct to ships, which do not involve any of the shops of the Industrial Department, make it desirable that the Supply Department be independent of the manager. Such an argument in my opinion is fallacious, and I am convinced that the best results can be obtained by having the manager responsible for supplying *all* needs of the fleet except those strictly military matters such as, enlisted and officer personnel, etc. Although the money value of stores issued on ships' requisitions frequently exceeds that of stores issued to the Industrial Department, nevertheless the purchase and issue of material used by the Industrial Department usually requires more care and attention than the larger volume of issues direct to the ships. That the manager should control the purchase, storing and issuing of material used in his own shops is a principle so firmly established in the commercial world as to need no argument here.

#### HULL AND MACHINERY DIVISIONS

(cc) It is evident that the proposed organization completely does away with any distinctions as between Hull and Machinery, and combines the two divisions into a single working unit. The retention of the divisional ideas and names, and the older ideas of bureau cognizance affecting yard work have been for years prolific causes of inefficiency and contention. They tend to permit

the building up in navy yards of small independent units of activity, each attempting to obtain as much power, prestige and authority as possible. Such conditions actually exist in nearly every yard with which I am familiar, and are largely responsible for failure to obtain the economies that are easily attainable by consolidation of shops and offices and the abolition at navy yards of bureau and division lines. It should be firmly fixed in the minds of all officers and employees at navy yards that the only bureau representative at the navy yard is the commandant, and that so far as they are concerned any legitimate order to do work is an order of the Navy Department itself, and not any one particular bureau or branch of the Navy Department. This result can be aided by reducing the number of different appropriations.

#### THE DUTIES OF THE CAPTAIN OF THE YARD WITH SPECIAL REFERENCE TO HIS RELATIONS WITH THE MANAGER'S DEPARTMENT, THE SUPPLY DEPARTMENT AND OTHER DEPARTMENTS OF THE YARD

(1) Reference to the organization chart shows plainly the relative position occupied by the captain of the yard (assistant commandant). He is the head of the Military Department, and should be of such rank as to succeed to command of the station in the absence of the commandant.

(2) The other "departments" of the yard are, as shown on the chart, assigned to either the captain of the yard or the manager, or split between them, as in the case of the yard surgeon and the disbursing officer. (Note that the proposed organization does away completely with the existing yard departments.) While the captain of the yard succeeds to command of the station in the absence of the commandant, yet when the commandant is present, his authority should be strictly confined to those activities assigned to him as shown on the chart organization.

#### THE DUTIES AND STATUS OF THE PUBLIC WORKS OFFICER, AND THE ASSIGNMENT OF YARDS AND DOCKS WORK AND ACTIVITIES

(1) Reference to the chart of organization will show that there is no public works officer of the yard. The work and activities of

the present Yards and Docks Department have been split up and assigned to the proper functional group of the organization; the drafting force to the consolidated drafting room under the planning superintendent; the clerical force to the office force of the office engineer; the outside working force to the proper group under the production engineer, etc.

(2) All contract work; dealings with outside contractors; the study of the yard and district development; the construction and extension of public works in and out of the yard; and similar broad questions should be handled by the district public works officer under the assistant commandant.

(3) Generally speaking, the plant superintendent could well be a civil engineer (though this is not essential). The plant superintendent, however, if not a civil engineer should have at least one assistant who is a civil engineer. If the amount of work and the size of the yard warrant it there should also be a civil engineer as an assistant to the office engineer.

(4) The underlying principle in the disposition of Yards and Docks work should be the same as that of C. and R. work and Engineering work, namely, its assignment to the proper functional group rather than the perpetuation or creation of work groups according to appropriations or bureaus.

#### THE STATUS OF THE DISBURSING OFFICE

(1) The disbursing officer is personally responsible for considerable sums of money; his responsibility is direct to the Bureau of Supplies and Accounts. It is considered unwise to disturb the present arrangement regarding the actual handling of money. For this reason the disbursing officer should come under both the assistant commandant and the manager. He should be responsible to the assistant commandant for all matters pertaining to pay and allowances of officers and enlisted men, and should be responsible to the manager for all matters pertaining to the pay of civil employees, and such items as handling special deposits for work done for outside parties, etc.

#### METHODS OF INSPECTION OF WORK AND THE NECESSITY FOR A SEPARATE INSPECTION DEPARTMENT

(1) No separate inspection department is considered advisable or necessary. The present method of having ships' officers inspect

work on ships is an economical and satisfactory method of handling this phase of inspection work. The inspection of other classes of *work* (as distinguished from *material*) done in the navy yard should be by the person or official for whom the work is performed, and an inspection notice of the same general character as that used by ships should be employed for such work. For example, work done for a lighthouse tender should be certified as being satisfactory by the commanding officer of the tender just as though she were a naval vessel; repairs to a steam hammer in the smithshop should be certified to by the shop superintendent; repairs to motor trucks should be certified to by the plant superintendent, etc.

(2) It is considered that the foregoing method will be most economical and at the same time safeguard the interests of the customer and of the yard.

(3) Aside from the inspection of *work* there is the inspection of material in various forms. Such inspections can best be grouped in one section or office and should include such items as the following:

- Purchased material generally,
- Food, lumber,
- Survey of equipage afloat,
- Survey of items ashore,
- Inspection of yard craft,
- Inspection of boilers, etc.

The above items, and others similar to them, should be grouped under the office engineer. He should be allowed a sufficient number of officers capable of carrying on this work. In large yards where conditions warrant it these inspectors should be supplemented by the necessary clerks, chemists, laboratorians, physical laboratory, chemical laboratory, food testing laboratory, etc. The holding of surveys on equipage is practically nothing more than an inspection and the same personnel can well be used for this purpose as is used for the other inspections because the same requirements exist as to knowledge of the classes of material used in the Navy both afloat and ashore.

(4) It is distinctly not recommended that a large inspection force be built up at once. The existing facilities and personnel for carrying on this work should be gradually combined

under the office engineer with as little expense as possible. It will ultimately be found that the number of officers and other persons engaged in this work can be greatly reduced by such consolidation.

#### THE SIGNING OF MAIL AND APPROVAL OF PLANS TOGETHER WITH THE REDUCTION, SIMPLIFICATION AND EXPEDI- TION OF CORRESPONDENCE

(1) The commandant should confine his activities to controlling the general policy of the yard as a whole, co-ordinating the military and industrial requirements, and carrying out the Navy Department's policy as regards navy yards. Mail to be signed by the commandant should be confined to letters directly bearing upon such matters; letters of detail should not require the commandant's signature unless they are "exceptions," that is, of such nature as to be outside of the ordinary run and which require separate and unusual action.

(2) The manager should sign all important mail from the yard to the Navy Department or any of the bureaus. This should not include routine mail of any nature.

(3) The office engineer should sign all routine reports of every nature. The Planning Superintendent or the head of the material section should sign all letters of inquiry, which are not *orders*, to outside commercial firms. (This is intended to cover such items as requests for quotations, time of delivery, catalogues, etc.) The manager should sign all internal memoranda or orders which deal with the Industrial Department of the yard only, and which do not conflict with or modify any existing yard regulations.

#### THE PLANNING SYSTEM REQUIRED AND THE SIZE AND COMPOSITION OF THE PLANNING FORCE

(1) The answer to this question depends largely upon what the planning system is supposed to accomplish, and what the planning superintendent's duties should be. To obtain the best results, the Planning Section should be the nerve center of the industrial organization; to it should come from all sources information and requests or orders for work. The Planning



Section should digest this information and should transform this data into definite and specific job orders or instructions for executing work. The routine clerical work of the Planning Section should be performed by the correspondence section, but the planning superintendent should be in a position to control the order and methods of performing such clerical work.

(2) This means that the Planning Section should receive (through the office superintendent) practically all incoming mail; should control the combined drafting room; should have a competent and sufficient force of planners and estimators; should have an ample material section; and should have sufficient personnel of suitable ratings to prepare and issue its instructions.

(3) The extent to which the planning of jobs should be carried has been the subject of much discussion. The best results can be obtained by having such planning go as far as the shop door,—the detail shop planning to be performed by the foreman assisted by the shop superintendent. The custom of issuing orders, as fast as written, to foreman for execution, more or less when they see fit, is not productive of the greatest efficiency. Job orders when planned, with all auxiliaries, should be sent to the production superintendent's office, and a detail dispatching system should be established, so that the control and distribution of the working force can remain in the hands of the Production Superintendent. No orders to do work should be issued to the masters until the work is ready to be performed and all material is available. Such a dispatching system at first appears complicated and expensive but the results to be obtained from it more than justify its establishment not only from the point of view of controlling the order of work, but in actual reduction in the cost of work.

(4) It is difficult, if not impossible, to measure in dollars and cents the efficiency or value of any planning system. Experience has, nevertheless, shown that wherever planning has been established, reductions in costs have always followed, even though the so-called overhead expense rate has been raised. It would be a grave mistake to limit in any way the size and composition of the planning force. This should be controlled absolutely by the planning superintendent, and he should be held

responsible together with the production engineer for keeping costs down. The present restriction in the actual numbers of the planners and estimators is a great mistake and can only result in increasing yard costs.

### THE SHOP SUPERVISORY FORCE

(1) Upon the shop supervisors (the leadingmen and quartermen) rests the ultimate possibility of turning out more work for less money. To produce this result such men must be well paid and be chosen with the utmost care. The present Civil Service Regulations which make the position of leadingmen absolutely dependent upon the number of employees, and hence upon the volume of work at the yard, exercise a very detrimental effect upon these men. Sixteen years of navy yard experience have shown that very few of such supervisors care to exercise their authority to the full extent, with the possibility always facing them of being reduced to mechanic and being forced to work by the side of the men whom he has previously "bossed." Navy yard supervisors are inadequately paid. It is much cheaper for the Government to employ high grade and highly paid foremen, quartermen and leadingmen, through whom the output of the working force can be increased, than to attempt to retain mediocre men at lower salaries to control the force of mechanics. Every gang of men works better under a good boss, a firm boss, a capable boss, and such men cannot be obtained unless they are adequately paid and assured that they will retain their positions as long as they make good.

### THE DRAFTING FORCE. SIZE AND DISTRIBUTION IN GRADES

(1) The same remarks apply regarding the drafting force as were made in connection with the planning force. The number of draftsmen and their distribution in grades should be left to the yard. The Navy Department, if it attempts to limit the number of draftsmen and their distribution in grades, is thereby attempting to control details with which it cannot be familiar. The drafting requirements vary from month to month, and the commandant and the manager are better fitted

to judge of the drafting needs than any organization at a distance from the yard. The old scheme of making a cast iron rule as to the number of clerks, number of estimators, and the number of draftsmen, reduces the authority of the yard officials while holding them to full responsibility. This method violates one of the fundamental principles of good management which is that responsibility should always be accompanied by authority. The manager is permitted to increase or decrease his force of mechanics, helpers and laborers to suit the needs of the work. There is no valid reason why he should not be permitted to vary his clerks, draftsmen, planners, and estimators to suit the volume of their work.

#### SUGGESTIONS TOWARDS SIMPLIFICATION OR BETTERMENT OF COST ACCOUNTING METHODS AND RETURNS

(1) The cost accounting system at navy yards as at present established, is for accomplishing two purposes:

(a) Recording and controlling expenditures under the various naval appropriations.

(b) Determining and recording the cost of work performed in navy yards.

Since the cost of all work done at navy yards is defrayed from naval appropriations, there is necessarily a connection between these two functions. The connection, however, if the quickest and most efficient results are to be obtained, should be made as slight as possible. It is always necessary for the executive officers at navy yards to so arrange the work that the monthly allotment of funds, or in the case of certain public works appropriations, the total appropriation, shall not be exceeded. When the monthly allotments are small this requires close and unremitting attention on the part of heads of divisions and others concerned. Such control of daily expenditures, involving as it does the following—discharges, all employment of labor, as well as the decision as to what items of repairs and alterations can be undertaken—is made doubly difficult by the fact that accurate and prompt reports in usable form are not obtainable from the Accounting Office. The daily appropriation expenditure sheet is always several days late, and furthermore, does not contain

information in such form as to enable the head of department to increase or reduce his labor and material expenditures without making several calculations and allowances. The principal difficulty in this regard is naturally overhead, and the principal item in the overhead is power. Accurate expenditure figures for power, and consequently the total overhead, are not available until the end of the month, so that an estimated allowance based on past experience must be made for this item.

(2) It is well known that the so-called "actual costs" of power and similar distributed items of overhead, consist in part at least of estimates (for example—all power is not metered and some classes of power cannot be metered at all). This being the case, it seems perfectly feasible to make the estimate in the first place to cover the power charge to be allocated to any particular appropriation, instead of making the estimates in detail as to shops and buildings, as is done at present. There are sufficient past records to enable such a lump sum estimate to be made with all the accuracy that is needed. Any overcharge or undercharge which may result when final costs are determined, could be taken into account in modifying the rates for succeeding periods. In the case of power, for example, I would suggest that the daily charge to each naval appropriation be a certain definite percentage of the labor expenditures for the day, based on the records for the past few years.

(3) It is believed that similar short cuts, which will be fully as accurate as the present so-called "actual charges," can be adopted, which will result in enabling the Accounting Office to furnish accurate statements of expenditures by appropriations within twenty-four hours after they have been incurred. Monthly allotments are now at a low ebb and the probability is that they will remain at this point for some time to come. Under these conditions when the amount of money available is not sufficient to perform all the work that should be done prompt and accurate statements of expenditures are particularly desirable.

(4) The Bureau of Supplies and Accounts has in a recent circular letter recognized the necessity for such short cuts by insisting that invoices and stub requisitions should always be priced promptly and that where the actual price is not available, an estimated price be used, the difference between it and the

actual price to be taken up on subsequent issues. If the same principle be adopted for all appropriations, the work of the Accounting Office will be greatly simplified, and the present difficulty of controlling expenditures will no longer be the "bugbear" it is now.

(5) With regard to the cost accounting as distinguished from appropriation accounting, it is believed that the present system has run away with its inventors. It is of course always necessary to know the real cost of work performed. This is more essential, however, for a commercial concern than for a government establishment. The present system was adopted partly, if not wholly, in an attempt to obtain navy yard costs which could be compared with those of private plants. Each year, however, certain so-called improvements or additions have been made until the mass of details is such that the real purpose of the work is obscured. If navy yard costs were continually used in comparison with private plants, and if based on these costs, decision was made as to whether work will be done in a navy yard or outside, they might be of some value. But it is well known that the reasons for assigning work to navy yards are usually more political or military than economic. It is therefore suggested that the present accounting system be gone over in detail with a view to reducing, if possible, the many sub-heads of expenditures and the elaborate sub-division of overhead. It is believed that by so doing, equally good results can be obtained for all practical purposes with about one half the number of employees in the Accounting Office.

#### ADVISABILITY OF ESTABLISHING AT YARDS SEPARATE ALLOTMENTS FOR THE FIELD FORCES, SUCH AS INSPECTION OFFICES, ETC.

(1) It is most emphatically urged that no separate allotments for any such purposes be established. The difficulty and complication of operating navy yards and the accounting work at yards is largely due to the numerous allotments and appropriations that have to be dealt with. Every effort should be made to combine allotments and eventually to combine appropriations rather than to sub-divide them further. The ideal condition would be, that the commandant is given a certain quarterly or semi-

annual fund for running the whole navy yard, requiring him only to report the expenditures in such detail as might be required by the department or by law. Under such conditions commandants could exercise their ability freely and could without any question improve the efficiency of the yards under their command. Every additional appropriation or allotment reduces the commandant's authority proportionately and consequently his ability to improve navy yard conditions. If we ever reach the point where all clerks are paid from the same appropriation, and all ship repair work is paid for by the same appropriation, the resultant economy due to reduction of clerical work and reduction of friction will be nothing short of amazing. It is to be hoped that the new budget system will assist in producing this result.

BRIEF GENERAL DISCUSSION ON THE SUBJECT OF INDUSTRIAL AND  
MILITARY OVERHEAD CHARGES AND THE FACTORS  
APPLICABLE TO THE SAME

(1) As stated above, it is believed that the details of the present accounting system are too elaborate. Any attempt to segregate those fixed charges which are due to the necessity for maintaining navy yards as military units in time of war is bound to be an estimate only. A board was appointed some five years ago to establish percentages or factors covering the so-called military portion of the overhead, which was thereafter to be deducted from, and not included in the so-called cost of work. These percentages are necessarily estimates, and always will be estimates, as there exist no means of determining such matters absolutely. There appears to be no reason why these admittedly arbitrary percentages should not be adhered to, unless the Bureau of Supplies and Accounts has been able to collect data for the period of the war. Comparison of total overhead charges during the war period when all yards were worked at maximum capacity, with the pre-war and post-war periods, might perhaps lead to modifying these percentages.

(2) In any event, it is considered desirable to take a sort of average of these detailed percentages and make a flat percentage deduction from the total overhead. Such a method would yield just as accurate results as the more detailed analysis now in effect.

(3) It is considered that the general question of overhead at navy yards has been subject to a great deal of misapprehension. The overhead of a yard exists and continues no matter whether it is actually charged to an expense account number, or allocated to Maintenance Yards and Docks or some other appropriation. Arbitrarily discharging employees charged to overhead, or reducing the pay of capable supervisors, or neglecting to repair machinery as soon as breakdowns occur, or failure to maintain buildings, shops, trucks, drydocks, etc., in good condition, instead of reducing the overhead, actually increase it. Such actions only delay remedying the trouble, and correction at a later date always costs more than if made promptly. The best way to turn out economical work is, no matter what the overhead charges may be, to employ capable and highly paid supervisors and plenty of them; to correct all defects and remedy all breakdowns as soon as they occur; and to provide plenty of the best and most up-to-date tools, appliances, and other necessities for the work.

(4) The present accounting system treats certain items as overhead. If the resulting overhead percentages are considered too high, the way to reduce the percentages (but not the way to reduce the actual overhead) is to change the accounting system rather than to neglect maintenance work that has to be performed.





## DISCUSSION

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### Relativity

(SEE PAGE 395, WHOLE NO. 229)

LIEUTENANT P. J. SEARLES, (CEC) U. S. NAVY.—May I venture some remarks in connection with an article "Relativity" by Lieutenant H. K. Lyle in the March PROCEEDINGS?

The author in his article has assumed that the Einstein theory of relativity in its completeness has been accepted by the scientific world, and he also gives the impression that the theory is a finished product ready to be placed in a glass case and admired. This is not quite true. For centuries philosophers and scientists have been endeavoring to answer the question, "Are space, motion, energy, etc., things in themselves, or is there a oneness behind them?" In other words, what is speed, what is energy, how are they related, are they really only different manifestations of the same thing? No definite answer has been made, and in the present state of our knowledge no definite answer can be made. But countless theories have been advanced, of which the Einstein theory is but one, and of which there are numerous modifications. After the Michelson and Morely experiment failed to prove the existence of an ether, considerable discussion arose as to the consequences of the failure. One of the foremost explanations was that advanced by Fitzgerald, who assumed that materials changed their length automatically when they were shifted from a position parallel to the earth's motion to a position at right angles to such motion. Of course there could be no usual method of measuring this Fitzgerald contraction (as it is called), as a yardstick used in measuring would also have its length changed. For example, take the case of a man looking at himself in a plane mirror. He sees what he considers a correct image of himself, and upon applying a tape to the image finds that it shows he is six feet in height. Next he looks at his image in a concave mirror and sees a distorted (or as he considers it) image of himself, but to his surprise upon applying the same tape, the image is still six feet high. This is roughly analogous to the Fitzgerald contraction. The contraction varies with the speed of the object; with the earth's orbital velocity about  $\frac{1}{(1000)}$  of the

velocity of light, the contraction would be  $\sqrt{1 - \frac{1}{(1000)^2}}$  or one part in 200,000,000. This means that the earth's diameter in the direction of its

motion would be shortened about  $2\frac{1}{2}$  inches. A velocity of 161,000 miles a second vertically upward would reduce any object to half its length at rest; such contraction, however, cannot be measured, for the measuring device would also contract. A slight confirmation is secured by considering an electrically charged sphere. When at rest relative to the earth, the lines of force radiate with equal intensity in all directions, but when the sphere is moved parallel to the earth's movement, those lines of force parallel to the motion (i. e., along the diameter parallel to the earth's motion) are of lesser intensity than those perpendicular to the direction of motion.

There is of course no question of the truth of the relativity of motion. An object on the earth's surface has a motion relative to the earth, the earth has a motion relative to the sun, and the sun (according to modern views) are about halfway between the center and the surface of the universal sphere, 300,000 light years in diameter, and is moving toward the center with a motion relative to other heavenly bodies. But the kind and degree of relativeness is in question. Einstein has given one view, although his putative followers, like Eddington, Tolman, Silberstein, etc., differ to a great extent in details.

Intimately connected with Einstein's theory is the non-Euclidean geometry. For all practical purposes Euclid is right, and has been almost universally considered so. But at different times geometers have devised a geometry applicable to a space in which the Euclidean postulates do not hold. The most famous of these is Lobychevsky with his theory of parallels. Riemann had a system, so had Gauss, and today Minkowski holds force. Perhaps they are right and Euclid wrong, but there is no present way of proving it. Their systems are analogous to medieval theologies. The old systems of gods, angels, cherubs, etc., were workable on paper, but the question was not "*Can* such a system exist?" but "*Does* such a system exist?" The non-Euclidean geometries are logical and *self-consistent*, but are not as yet consistent with observed phenomena. For instance, Minkowski tells of a universe, finite but unbounded, somewhat hyperbolic in nature, with four dimensions; the nearest description of it is of a sort of an old-fashioned phonograph horn which expands out and back on itself—except that whereas the horn is in three dimensions, Minkowski's universe is in four. Perhaps it does exist but we do not know so definitely as yet. Of course time can be considered as a fourth dimension, but it is most certainly confusing when some geometers and relativists attempt to translate time into space and vice versa. As well consider beefsteak or a telephone as extra dimensions and translate them in six meters of steak or forty seconds of telephone line. Perhaps it is possible, but it has not yet been done in practice. Self-consistent theories, no matter how fantastic, are always possible, but they cannot always be applied to the world as we know it to exist.

Einstein differs from Newton in his conception of the reality of what we know as gravitation. The older idea was to consider it as force acting at a distance. Einstein believes that space contains humps or warps, and that

matter traveling through such space is deflected from its straight course by such warps and gives rise to the effect of gravitation—or whatever one may wish to call it. Acceleration also enters into the subject in an abstruse manner. Perhaps this is true, perhaps space containing matter is non-Euclidean, and space without matter is Euclidean. We cannot tell at present, but the balance is still on the side of Euclid because his geometry holds for the world as we know it, though perhaps not for some theoretical universe which may or may not exist. Any kind of a space can be imagined, depending upon the mesh system or co-ordinates used, and any explanation can be given to any phenomena, but such imagined explanations are not necessarily true and should be received with caution until proven. The discussion might be extended into all lines of physics, etc., and with varying assumptions we might prove that momentum and energy are the same thing, that speed can be changed into mass and vice versa, but all such theories need definite proof before acceptance. And despite Lieutenant Lyle's assertion, the truths of Einstein's theory are not proven. Consider the three so-called proofs:

1. Light is affected by gravity. This is probably true, although the amount is in doubt. Using Newton's mechanics, a ray of light passing near the sun, as the light from Beta Cassiopeia did during the eclipse expedition mentioned by the author, should have been deflected about 0.75 seconds of angular distance. According to Einstein, the deflection should have been about 1.75 seconds. The Sobral, Brazil, expedition photographs gave a deflection of 1.98; the Principe, Africa, photographs showed 1.62. These figures are close to the Einstein prediction, but not exactly so. Any errors in the photographic clockwork, warped plates, etc., may have caused a considerable error. Not until more such photographs are taken, can we accept any result as true.

2. Advance of the perihelion of Mercury. The perihelion of Mercury is advancing at the rate of 574 seconds of arc per century (not 43 seconds as stated by the author). Due to gravitational influence of other planets, 532 seconds per century are accounted for by Newton's theory. According to Einstein's theory, all 574 seconds are accounted for (although the author says that according to Einstein the advance should be but 43 seconds). But what does this prove? Perhaps other heavenly bodies, not yet discovered, are exerting an unknown effect; perhaps "cosmic dust" (if it really exists) may account for it; perhaps a number of factors are at present not sufficiently known to account for the entire advance. A very significant point that is not mentioned by enthusiastic Einstein followers is that the Newtonian theory accounts accurately for the known aberration of the perihelion of Venus, which aberration is not at all what it should be according to Einstein. Dr. Pond has a theory of his own, more or less plausible, which accounts accurately for aberrations of all planets.

3. Slight advance in the lines of the solar spectrum as compared to the laboratory spectrum. Due to the relative motions of the earth and the sun, those bodies are at practically all times approaching to or receding from

each other. Such motion causes a shifting of the lines of the spectrum toward one side or the other (depending upon whether the earth is approaching the sun or the reverse). This is the Doppler effect, long known to physicists, and easily measurable. But Einstein says that in the intense gravitational field of the sun the spectrum should be shifted slightly toward the red end; the displacement being plus 0.0080A. (A is the Angstrom unit or 0.000000001 meter.) Due to the difficulty of separating the Einstein effect (if it exists) from the Doppler effect, no definite results have been found. St. John at Mt. Wilson detected plus 0.0018A shift for the cyanogen lines (only certain lines can be used), although he is not positive about it. Evershed found plus 0.0060 at the North Pole of the sun and plus 0.0080 at the South Pole, also that some lines gave a greater shift than others, although according to Einstein the amount of shift is constant and independent of the kind of lines.

Personally I believe Einstein has a portion of truth in his theories, somewhat overlaid by a large amount of chaff which must be cleared away before we can get a true perception of the universe. He most certainly is an ingenious thinker, possibly a great physicist, and deserves universal recognition for his determined attack on the problems of time and space. Any attempt to place the fundamentals of physics on a solid basis deserves praise. But Einstein has become too metaphysical, he has become wrapped up in fanciful multi-dimensional theories, has wandered into the aridity of mathematical abstractions, until his world is no longer the world in which we actually live. Either he or his successors must clear out the abstractions and rescue the basic theory from the muddy morass of speculation. Then we may have gained an advance in knowledge well worth the struggle.

### The General Board

(SEE PAGE 189, WHOLE No. 228)

CHIEF CONSTRUCTOR D. W. TAYLOR, U. S. N.—The article of Admiral Wainwright in the February number of the NAVAL INSTITUTE PROCEEDINGS on The General Board is a valuable contribution to the history of the navy department, although the author seems at times to take a roseate view of the capacities and achievements of the Board, which is his nominal subject.

I believe the general board is one of the most valuable organs of the department, and hope it will long continue so. In its early years it had some vicissitudes and was at one time something of a storm center in the department. The author does not touch upon a somewhat remarkable occurrence in 1904. Secretary Moody then recommended the "legalizing" of the general board, and a bill was introduced on which the house naval committee held hearings in the spring of 1904. Secretary Moody appeared before the committee in advocacy of the bill, which was a step toward the establishment of a general staff. On April 28, 1904, Assistant Secretary Darling, who stated that he appeared with the knowledge and consent of

Secretary Moody, made a violent attack before the committee on the bill and virtually killed it. Of late years the general board has settled down and has certainly done very useful work, which I am inclined to think is hardly appreciated by the service at large at its true value.

A disinterested body such as this, composed of officers of wide and mature experience, constitutes a body of elder statesmen, as it were. It is a kind of court of appeals for all sorts of complicated and difficult questions, and as the guide, philosopher and friend generally of the secretary of the navy, is invaluable.

The author does not confine himself to the subject of The General Board, and is somewhat discursive at various points. He does not approve of the board on construction, using against it the stock arguments we heard for many years. I have no wish to discuss the merits or demerits of the board on construction, abolished so many years ago, but the "horrible example" of its shortcomings, quoted by the author, impels me to come to the defense of the memory of my old chiefs—Chief Constructor Hichborn and Secretary Herbert—who honored me with their friendship as long as they lived, and who are placed in a very bad light by the author's circumstantial recital. The case to which he refers is evidently that of the *Dahlgren, Craven and Farragut* in 1896 and his statements are a remarkable illustration of the fallibility of the human memory.

It is a fact that there was a controversy in 1896 regarding these torpedo boats, but this is about the only fact accurately remembered by the author. As to the subject of the controversy, the participants in the controversy, the incidents of the controversy and the decision of the controversy, his memory has woefully deceived him. The papers in the case are still on file and have been consulted by me. I quote below the author's statement, and have indicated at suitable points, by *numbers* in brackets, the statements which the record shows to be absolutely erroneous. I have also indicated, by *letters* in brackets, a few statements which are not specifically controverted by the record, but are so inconsistent with known facts in the record that I believe them erroneous:

The decisions of this board [board on construction] were not always approved by the secretary. Once when the issue was the plans for several new torpedo boats (1), the military members all decided to adopt plans similar to a British type (2), the largest then built, that had proved quite successful and was somewhat larger than any we had attempted. The chief constructor wanted to adopt a much smaller boat after a French design (3), one purely experimental and one the designer admitted had been built as an experiment to obtain speed in a small boat without serious consideration of other military factors (a). The chief constructor took his minority report to the secretary (4) and obtained a decision in his favor by the argument that as torpedo boats were sneak boats, the smaller they were the better they could sneak upon the enemy, and all questions of seaworthiness, endurance or armament were brushed aside (b). It was only by the great influence of Admiral Sampson, then chief of the bureau of ordnance, that the secretary was induced to reverse his first decision and make a fifty-fifty one (5). The big boats proved good

for their time; the small ones proved a failure and were called the bath tubs. Although well constructed at Bath, the design was a failure. Thus was money wasted and progress retarded by the decision of a civilian who lacked the groundwork of knowledge upon which to found his decision (c).

The Naval Appropriation Act of June 10, 1896, which gave us three battleships and a number of other craft, authorized "three torpedo boats, to have a maximum speed of not less than thirty knots, to cost in all not exceeding eight hundred thousand dollars." These vessels were required to be constructed by contract, award to be made to the "lowest best responsible bidder."

It was required that contracts should be made within 120 days, namely, on or before October 8, 1896. No plans of these boats were prepared by the navy department, the circular defining their chief characteristics stating that:

The department in advertising for the boats of thirty knots' speed to be built by contract, will invite proposals for the construction of the hull, including engines, boilers, and appurtenances, and equipment, complete in all respects, in accordance with the plans and specifications provided by the bidder.

Bids were received September 18, 1896, and referred for analysis and recommendation to the chief constructor (Hichborn) and the engineer-in-chief (Melville) as then customary.

On September 28, 1896, the chief constructor and engineer-in-chief reported to the department, recommending an award.

This report was returned to the bureaus September 29, 1896, for further report and recommendation. The bureaus were directed also to confer with the bureau of ordnance concerning the armament and ordnance weights proposed to be carried. On October 1, the chief constructor and the engineer-in-chief made a second report. The same day (October 1, 1896) this second report was returned to the bureaus for further report, and this time the chief of the bureau of ordnance, Admiral Sampson, was associated with the other two chiefs making a board of three. The chief constructor and the engineer-in-chief joined in making a third report. Also under date of October 3, 1896, they made a supplementary report. Under date of October 5, 1896, Admiral Sampson submitted a minority report—the only report submitted by him and the only minority report concerned in this transaction.

The record shows also that on the same date one bidder submitted a brief on the subject of the proper award under the law and that on the same day (October 5, 1896) the secretary decided the award. This haste was necessary because the contracts had to be made by October 8 under the law.

Coming now to an analysis of the author's very circumstantial recountal, in the light of the facts we have the following:

- (1) Once when the issue was the plans for several new torpedo boats.

The matter of the plans for the torpedo boats in question was never an issue in the board on construction because the matter was never referred to it.

(2) The military members all decided to adopt plans similar to a British type.

As the matter was not before the board, statement (2) is obviously erroneous.

(3) The chief constructor wanted to adopt a much smaller boat after a French design.

The chief constructor as a member of the board on construction did not pass upon the question of plans. If the statement is taken as representing his views on the matter he did pass on, the preference ascribed to him is erroneous. See (b) below.

(a) One purely experimental and one the designer admitted had been built as an experiment to obtain speed in a small boat without serious consideration of other military factors.

I have been able to discover nothing in the record to warrant any such statement, and cannot believe it correct. It is calculated to make the designer, M. Normand, the famous French torpedo boat designer and builder, turn in his grave.

(4) The chief constructor took his minority report to the secretary.

The chief constructor made no minority report in this matter. He united with the engineer-in-chief in signing three reports and an explanatory letter. Up to the time of the third report no one else was concerned in the matter. Just before the third report the chief of ordnance was associated with the other two, making a board of three. The chief of ordnance refused to sign with the others, and submitted a minority report—the only minority report in this matter.

(b) and obtained a decision in his favor by the argument that as torpedo boats were sneak boats, the smaller they were the better they could sneak upon the enemy, and all questions of seaworthiness, endurance or armament were brushed aside.

If the chief constructor made any such absurd argument, it was wholly inconsistent with his reports of record, in which he was always associated with the engineer-in-chief. The record shows clearly that questions of seaworthiness, etc., were not brushed aside. Conclusive evidence of the views of the majority, the chief constructor and engineer-in-chief, upon the question of size is contained in the minority report of Admiral Sampson who said:

There is apparently no diversity of opinion among the members of the board in regard to the desirability of the larger size boat, as is shown by the following extracts from the reports of the chief of bureau of steam engineering and chief of bureau of construction and repair.

One of the majority reports contains explanations of the differences between the torpedo boat proper and the torpedo boat destroyer type—then in the early stages of its development.

(5) It was only by the great influence of Admiral Sampson, then chief of the bureau of ordnance, that the secretary was induced to reverse his first decision and make a fifty-fifty one.

Any decision reversed was not upon the question of size and type of boats. The papers show that the secretary at one time instructed the bureaus that the bids of one bidder could not be considered under the law. The next day he withdrew that instruction, but in his final and *only* decision on the award of contracts he ruled out the bids in question. The decision was hardly a fifty-fifty one. It was wholly against the minority but the award of contracts was in accordance with the recommendation of the majority on the assumption that a certain bid was legal and entitled to consideration though when making the award the secretary ruled the bid in question could not be considered. On that basis the majority had made a somewhat different recommendation.

(c) Thus was money wasted and progress retarded by the decision of a civilian who lacked the groundwork of knowledge upon which to found his decision.

The question at issue was not primarily "military" but one of the legal award of certain contracts on the basis of bids received. The complications were mainly legal complications, and the secretary of the navy, by profession a lawyer, certainly could not be said to lack the groundwork of knowledge.

The main questions were legal and may be briefly stated. They were:

First—Whether the bid of the Herreshoff Company could be accepted within the law.

Second—Whether the bid of the Bath Company could be rejected under the law.

There was a third question. Congress had specifically authorized torpedo boats. There was only one bidder for torpedo boats proper as understood at that time. One bid was for a duplicate of the latest British torpedo boat destroyer (the *Desperate* of 240 tons' displacement—this was in 1896) and the other bids were for vessels betwixt and between the two types as then existing. So the department had to decide how far it could go in building destroyers under an authorization for torpedo boats. The decision was to build a substantial duplicate of the latest British destroyer and two substantial duplicates of the latest French torpedo boats. The record shows however that before making this award the secretary of the navy obtained a waiver from the Bath Company of their previously asserted right under the law to a contract for three torpedo boats.

Having endeavored to give the facts regarding the author's relation concerning the secretary of the navy of twenty-six years ago, I should like to comment briefly on his statement concerning the secretary of two years ago. The author says:

When Mr. Daniels was asked by the Hale investigating committee for the general board's plan for the war, he answered "search me." *After his*



*departure from the department, his desk was searched and the plans found;* and it is safe to assume that had this plan been followed, many things would have been undertaken at once, that either never were started or were undertaken some time after we entered the war on paper.

While I have not searched the two million words or so of the Hale committee's record for the part of it dealing with this plan, my impression is that the particular plan referred to was by no means of the importance ascribed it by the author. It was something submitted by the general board in February, 1917, of such a nature that it did not keep a copy of it. It is well known of course that as soon as we entered the war in April, 1917, the general board was almost at once in close consultation with French and British admirals and prepared to make recommendations with full information as to the real situation.

As regards the statement italicized by the author, "*after his departure from the department his desk was seached and the plans found,*" this has been current gossip in the navy department, but seems to be nothing but a "galley yarn" out of whole cloth. The best information I can gather is that when Secretary Daniels departed from the navy department, both of the desks which he used were absolutely empty. This would be natural, as they were at once taken over by his successor. If this is correct, the plan could have been found in his desk after his departure only if it were placed in his desk after his departure. The "galley yarn" usually has it that the general board now has the plan in question. I have been assured, however, that this is not the case.

The author is evidently a strong believer in a general staff for the navy, and considers the general board as tending in that direction, the aid system of Secretary Meyer a further step forward, and the establishment of the office of operations as a step backward. I should like to say a few plain words on this general staff question:

What is a general staff? Without answering that question for the present, it may be pointed out that one complication in our conception of a general staff is due to an eccentricity of the English language. We are apt to consider that a general staff is a staff to run things in "general." As a matter of fact, in Germany, the birthplace of the general staff and held up to us before the war as the location of the perfect and infallible general staff, there was before the war the general staff for the army and the admiral staff for the navy. The general staff was the staff of the general, the naval or admiral staff was the staff of the admiral. For many years before 1914 Von Tirpitz was the head of what corresponded fairly closely to our navy department, but he was not the head of the admiral staff and his principal asset seems to have been his ability to get favorable action from the German *Reichsrath*. Apparently the Emperor, the commander-in-chief, had a personal staff separate from the admiral staff, but which was naturally not without influence upon the course of events.

The author appears to have a very low opinion of the law establishing the office of operations as an approach to the general staff idea. In Great

Britain at present there is a naval staff (they do not call it a general staff) very highly organized, and if the author will consult an admiralty 1921 pamphlet on *Distribution of the Duties of the Naval Staff* he will find that the British naval staff is organized and apparently operates almost exactly as our office of operations would be organized and would operate in strict compliance with the letter and the spirit of the law establishing it. So certainly from the British conception of a staff for the navy, the law creating the office of operations could not be regarded as a step backward.

I have not yet answered the question "What is a general staff?" It has been advocated for our navy now for many years, and so far as I can judge when we get behind the verbal camouflage and smoke screens of most of its advocates, one essential feature is that it is an organization where the secretary of the navy is reduced to a figurehead. This is no new idea in the United States navy, but has existed as long as we have had a navy department. At times it has prevailed. In 1815 congress established a board of navy commissioners, composed of three officers of the navy which, though nominally under the office of the secretary of the navy, was empowered to "discharge all the ministerial duties of said office, relative to the procurement of naval stores and materials and the construction, armament, equipment and employment of vessels of war as well as all other matters connected with the naval establishment of the United States."

These were broad powers. From 1815 to 1824 and again from 1827 to 1837 the board of navy commissioners was headed by John Rodgers, one of the greatest men who ever served in the United States navy, and yet in 1842 congress abolished the board which for some ten years had been much criticized both in and out of the navy. For instance, Commodore Charles Stewart wrote concerning it that the "absence of economy in the construction, equipment and repair of our vessels; the diversity in their models, classes and qualities; the capacity of some and the worthlessness of others; the excessive waste of continual experiments, have never been surpassed, if ever equaled, in any other naval establishment of the same limits."

The act of 1842 restored the full authority and responsibility of the secretary of the navy and established the bureau system where the immediate subordinates of the secretary are directly responsible to him and to him alone. These principles have never been changed by law, but in 1869, a new secretary, A. E. Borie, virtually abdicated by issuing an order that "all matters relating to the navy coming under the cognizance of the different bureaus will be submitted to Vice-Admiral Porter before being transmitted to the secretary of the navy." Secretary Borie lasted but a few months, and the experience of the navy with Porter *de facto* secretary, and Secretary Borie a figurehead, was not a very happy one.

For twenty years or so now we have heard much advocacy of a general staff, which, as I have already said, would render the secretary of the navy a virtual figurehead. I am firmly convinced that any organization which produces this result would be a fatal mistake.

The navy *must* be considered in this connection from the non-naval point of view. It is not an independent organization, and like every other part of the executive it is in the end dependent upon the legislative branch of the government representing directly our ultimate masters—the people of the United States.

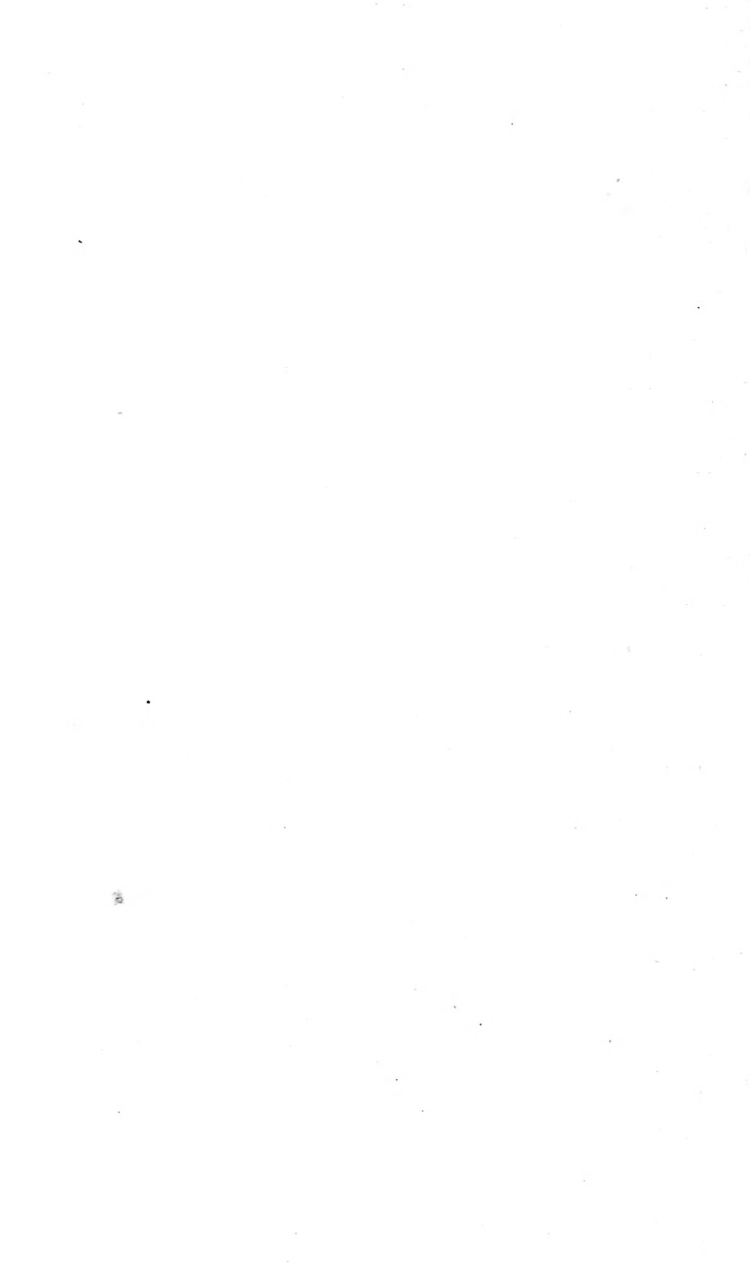
Congress is our board of directors, as it were, for a part of the functions performed by an ordinary board of directors of a large corporation. Congress does not appoint the officers of our corporation as a board of directors usually does, though if we have an officer who is not *persona grata* with Congress, it is apt to find means to impress its views. Congress does, however, have the most important functions of a board of directors. It controls the purse strings not only in sum but in detail. Evidently then it is essential to the navy that it be represented in the best possible manner before its board of directors.

The best spokesman for the navy is its civilian secretary. Even those who advocate making the secretary a figurehead generally admit this. They overlook, however, one vital fact: The navy department is not very far from Capitol Hill. No secretary can be a figurehead in the navy department and receive proper consideration on Capitol Hill. Admiral Wainwright says, "The civil element always should and always will dominate, and the military experts will always have to struggle for reasonable preparation. . . ." Very true, but just who is to be the civil dominator of the navy? Is it to be the civilian secretary, clothed with authority, looked up to as its head and loyally supported by the whole navy, or is it to be our board of directors in congress, dealing reluctantly with a general staff or other body of men in uniform (always distasteful to the English-speaking legislator) able to dominate only indirectly by legislation or by withholding money, with ingrained distrust of the military experts as incapable of understanding or appreciating the point of view of the congressman?

Many officers have wondered at the unprecedented success of Secretary Daniels in his dealing with congress. If some chemist could analyze the intangible elements going to make up his influence I am sure there would stand out as important, if not pre-eminent, the fact that he was under constant attack from naval officers. Every knock was a boost, in that it helped to impress upon congress the belief that it was not dealing with a figurehead, and that to paraphrase the author's words the civil element was dominating in the navy department.

Congress, and the people of the United States whom congress represents, will never be permanently satisfied with any other arrangement.

It may be that in some guise or other the general staff advocates in the navy will some day achieve an organization where the civilian secretary will be a negligible quantity. It is my firm belief that such an achievement will be on a parity with the case where "the operation was a success but the patient died."



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ANNAPOLIS, MD., April, 1922.

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# PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT R. A. HALL, U. S. NAVY

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## FRANCE

**WARSHIPS DROPPED BY FRENCH SENATE.**—The French Senate, by a vote of 235 to 2, adopted the naval program calling for abandonment of the construction of warships of the *Normandie* type, the transformation of the dreadnaught *Bearn* into a mother ship for airplanes, and the laying down of certain light units.

In the discussion preceding the vote Viscount de Kerguezec, president of the Senate's navy committee, declared:

"Henceforth, it will be impossible to make any resolution whatever concerning naval matters without taking into account what happened at Washington."

M. de Kerguezec discussed at length the much-talked-of Castex incident, and declared that the opinion of Captain Castex, whose article on the submarine, published by the *Revue Maritime*, figured in the submarine discussions at the Washington conference, was purely personal. The speaker declared the French Parliament long ago repudiated the doctrine of submarine piracy and considered the submarine a purely defensive weapon.

M. de Kerguezec strongly urged adoption of the program because, he said, it soon would be impossible to embark France's crews and officers for lack of ships. "We were much surprised to learn," he said, "that the naval program laid before the Washington Conference in the name of France was drawn up by the naval general staff, although really no naval program can be presented in the name of France unless it has been approved by Parliament."

The French naval program, as previously cabled to this country, provides for the construction of three cruisers, of 8,000 tons, 98,000 horse-power, 38

knots, with eight guns of 150 millimeters each, four guns of 75 millimeters and twelve torpedo tubes; six torpedo destroyers and twelve torpedoboats, the destroyers of 2,500 tons, 35½ knots, with six 18-centimeter guns and six torpedo tubes, and the torpedoboats of 1,400 tons, 32½ knots, together with twelve submarines of 1,100 tons and an action radius of 7,000 miles.—*Washington Post*, 18 March, 1922.

**FRENCH AIR BUDGET.**—The French air budget for 1922, as passed by Parliament, totals approximately 436,000,000 francs. The main appropriations are: Minister of War, for home squadrons, 214,287,500 francs; Algeria and Tunis, 9,936,490 francs; Morocco, 22,173,092 francs; total 246,397,082 francs. Under Secretary of State Department for Aeronautics: 147,219,970 francs, which includes foreign air attachés, 200,000 francs; technical service, 5,400,000 francs; prizes and subsidies for commercial aviation, 45,382,000 francs. Ministry of Marine, 37,318,543 francs; Ministry of Colonies, 4,991,000 francs.

Of considerable interest and importance are the figures now available for the past year's growth of flights and passengers and freight carried. For the full twelve months to December 31, 1921, compared with 1920, the figures are: 1921—flights, 4,022; passengers, 13,369; goods, 150,309 kg.; mails, 3,308 kg. 1920—flights, 3,359; passengers 6,850; goods, 120,745 kg.; mails, 1,474 kg. For the month of December the figures are: 148 flights (arrivals and departures), 359 passengers, 7,277 kg. of freight, and 84 kg. of mails. These figures are for the airways in operation between Paris and London; Paris, Brussels, and Amsterdam; Paris, Strasbourg, Prague, and Warsaw; Paris and Amsterdam; and Paris and Havre.—*Aviation*, 3 March, 1922.

**OIL BY PIPE-LINE TO PARIS.**—It seems probable, says a Paris report, that within the next three months plans may be approved for the laying of a pipe-line between Havre and Paris to convey petroleum and petrol direct from tank steamers to the French capital. The concessionaires have to establish at their own cost works for the transport of a minimum of 2,400 tons of petroleum per day between Havre and Paris, with reservoirs at each end of the line representing a minimum total capacity of 60,000 tons.—*Engineering and Industrial Management*, 2 February, 1922.

**FRENCH PORTS OPEN TO GERMAN VESSELS.**—German vessels bound for South and North America will enjoy all privileges of the international commerce and shipping regulations and will be permitted to call at French ports, "providing the German companies fulfill the commerce and shipping rules." This statement was made to the Associated official quarters today.

First among these rules is that a request be made for permission to enter a port of call, which, it was said, was not done in the case of the German steamer *Cape Polonio* or in any other instance; thus there was no request and no refusal. (It has been alleged by the Germans that the steamer *Cape Polonio* on her recent trip to South America was refused permission by the French to touch at Boulogne, but official denial of this has been made by the French government.)

The French Ministry of Merchant Marine makes no secret of its belief that there is a question of boycott against French shipping at Hamburg and Bremen, consisting of refusal to allow the same privileges to French tonnage as obtain for British and other steamers. But, it is declared at the ministry, this question is not related to the reported refusal to allow German liners to call at Boulogne.—*Washington Post*, 5 March, 1922.

**ACUTE DEPRESSION IN FRENCH SHIPBUILDING INDUSTRY.**—The depression in the shipbuilding industry is being more acutely felt in France than in

other European countries. The country's merchant marine has been re-constituted without the home shipyards contributing to its rehabilitation, while the allocation of surrendered German tonnage has provided France with a tonnage in excess of her requirements so that there is little prospect of the French shipyards finding much work to do in the future. These number twenty in all and employ in normal times 60,000 men. They are capable of turning out 500,000 tons of new shipping a year.—*Nautical Gazette*, 11 March, 1922.

### GERMANY

GERMAN DISARMAMENT—EFFECT ON INDUSTRY.—It is said of the Washington Conference that the victorious powers, having disarmed their enemies, are now voluntarily disarming themselves. The effect of this disarmament on German industries will be of particular interest at this juncture, and a brief review of the position may be welcomed by our readers.

The naval clauses of the Peace Treaty can be summarised shortly as follows: (a) Germany may have a navy not exceeding the following number of ships in commission: six pre-war dreadnoughts, six light cruisers, twelve destroyers, and twelve torpedo boats, with no submarines of any type at all; (b) these ships may only be replaced after a definite life and the replacing ships must not exceed the tonnage given below:

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	Life Years	Displacement Tons
Armoured ships.....	20	10,000
Light cruisers.....	20	6,000
Destroyers.....	15	800
Torpedo boats.....	15	200

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(c) The personnel is to be reduced to 15,000, with not more than 1,500 officers; (d) all warships under construction at the signing of the Armistice are to be broken up.

The remainder of the German fleet, except for some very old ships, having been surrendered it will be seen that the reduction in that fleet is much more drastic than the proposals of the Washington Conference. In Germany, as in this country, the establishments affected are of three kinds, viz.: (a) the old Imperial establishments corresponding to our Royal dockyards and arsenals; (b) the large armament works and shipyards which specialised in naval and military work; (c) smaller works only utilised during the Great War and now engaged in their pre-war occupation.

The main establishments under heading (a) include the following: the ex-Imperial dockyards at Wilhelmshaven, Kiel, and Danzig, the arsenal at Spandau near Berlin, and the torpedo factory at Friedrichsort on Kiel Bay. So far as the dockyards are concerned, Danzig having been taken away from Germany the yard there is not under its control. It has been decided to leave Wilhelmshaven as a building yard to help in supplying the warships required in the future. It is capable of building the hull and supplying the machinery of a battle cruiser of the *Hindenburg* class. It also has graving docks large enough to accommodate the biggest ship allowed for the post-war fleet. These occupations only utilise a part of this extensive dockyard, and the remainder has been separated and handed over to a company under the control of the German Treasury, which is developing it on commercial lines, it being suited for general engineering work and the building of small steamers, etc.

The ex-Imperial yard at Kiel has also been divided into two parts. One which contains the graving docks and basins will be used as the

Baltic Sea base for the post-war fleet, and the remainder, including the building slips, the engineering shops, etc., has been transferred to a department under the Treasury and is being worked as an ordinary shipyard. Work on some 8,000-ton steamers has been begun. The department of the Treasury previously mentioned has also taken control of the Friedrichsort torpedo factory and the arsenal at Spandau. In all cases the management has been recruited from the officials previously attached to each place, but their number and status have been altered to agree with the reduced personnel and the changed conditions. The number of employees in these various establishments as given in *Schiffbau* have varied as follows: The oldest dockyard, that at Danzig, employed about 3,500 men before the war and increased its staff to 9,000 men in 1918. This yard, as mentioned before, is not now under German control. The Imperial yard at Wilhelmshaven employed 11,000 men in 1914 and this number increased to 23,000 in 1918. The post-war numbers have dropped to 11,000, of which about 4,000 are employed in the commercial yard. The employees at the Imperial yard, Kiel, numbered 9,200 before the war, but a total of 17,000 was reached in 1918. After the Armistice the number was reduced to about 11,800, of which the greater number were absorbed by the commercial part of the yard. The big torpedo factory at Friedrichsort increased its numbers from 3,000 to 5,500 during the war. When transferred to the Treasury the personnel had been reduced to the former figure. These reductions in personnel have led to a great reduction in the number of permanent officials. At present they number less than twenty-five per cent of the pre-war figures.

It is typical of the existing *régime* that efforts should be made to use the state yards and factories up to the hilt to meet the needs of the future. Control has passed from the military to the civil authorities, and work has been distributed so as to give employment generally. This state enterprise is favoured by the workmen generally, and they resent any suggestion to transfer any of these industrial concerns to private owners. The conditions of labour, hours, and wages are standardised throughout the country. There are no doubt political reasons for the adoption of this form of nationalisation. It is notorious that the dockyard towns were centres of unrest, and revolts in them precipitated the asking for the Armistice. By giving employment this spirit will be quieted. On the other hand, the unemployed official class are very discontented and generally have monarchistic tendencies.

The second type of establishment corresponds to our big armament works. The firm of Krupp was the outstanding example. With its steel works at Essen, its shipyard at Kiel and the allied establishments throughout the country, it employed about 200,000 hands during the war. The M. A. N. and A. E. G. groups also employed thousands of men on munitions, and the optical works of Zeiss and Goerz were also on war work entirely. In short, all the big engineering concerns of Germany were engaged on war contracts, and when the Armistice came had to be transformed to a peace production basis.

It has always been the rule to build the great majority of the German fleet in private shipyards, and, in fact, as mentioned previously, only one Imperial yard could build a battlecruiser, namely, Wilhelmshaven. So far as Kiel was concerned it could build smaller battleships and light cruisers. Apart from one battlecruiser on the slips at the former dockyard and one light cruiser launched from Kiel, the whole of the warships and submarines under construction at the time of the Armistice were being built in private shipyards.

The amount of work in progress was as follows: battleships, 3; battlecruisers, 4; light cruisers, 7; torpedo craft, 114; submarines, 240.

In addition, orders had been placed for two large cruisers and one small cruiser, and over two hundred submarines, but work on them had not been begun.

The effect of the sudden stoppage of work on this big programme was to dislocate the shipbuilding and marine engineering industry. As with the auxiliary vessels which were in hand at smaller yards for the navy, and were also stopped, it represented practically the whole of the work in progress at the time. Labor trouble arose immediately, and the breakdown of the transport arrangements, the shortage of fuel and all raw materials accentuated the difficulties in the yards. A form of communistic control of industry was attempted, and for a period the Workmen's Councils took charge. It was no uncommon thing to see the red flag flying over works. In Hamburg, which had suffered severely from the blockade, the shortage of fuel and food being pronounced, two of the largest shipyards closed down for want of fuel. In actual fact, a portion of the men on the books could have been employed, but the trade unions refused to let them work unless all were paid. The end of the war brought a general slackening of effort and demands of all kinds for improvement in pay and conditions of labour. The street fighting which was prevalent interfered seriously with industry. With the establishment of a stable government this phase passed and conditions steadily improved. Strikes, except for political purposes, have been very rare, and the output is now nearly up to the pre-war figure. Piecework and overtime, banned at the first flush of the revolution, have gradually been reinstated and are now the general rule.

The same shipyards build both warships and merchantmen, the plant required being practically identical. In fact, most of the large yards under heading (b) normally had both types of ships under construction at the same time. Thus the only problem was one of obtaining work. Immediately after the Armistice and up to the signing of the Peace Treaty there was a large volume of reconditioning and refitting work as well as the completing of merchantmen due for surrender to the Allies, which kept the reduced staffs busy. In addition, such yards as were building submarines had to destroy those vessels.

By the time peace was signed the conditions had materially improved. The management could estimate the cost and time on a job fairly closely and the workmen did not insist on so many of the rules which tend to restrict output in this country. Accordingly, of the large volume of work which was released when peace was signed, a considerable portion from neighbouring countries went to German yards. In addition, the warships under construction detailed above had to be broken up, and many men found employment on that work.

It is remarkable that the shipbuilding industry of Germany has profited from causes, most of which are the consequence of that country losing the war; but it must be remembered that the German workman has, apart from the short period of unrest previously mentioned, assisted in every way to put the industry on a stable basis.—*The Engineer*, 10 March, 1922.

GERMAN AND AUSTRIAN NOTES.—Vice-Admiral Rogge, formerly director of the Ordnance Division of the German Marine-Amt, writes in the *Marine Rundschau* to query certain statements made in the British technical press last September concerning comparative trials of British and German armour-plates, the latter taken from the *Baden*. These trials, it will be recalled, demonstrated the superiority of the British plates over the Krupp product. Admiral Rogge adduces a number of facts and figures relating to comparative tests held in Germany before and during the war of British, French, and Krupp plates, from all of which, he claims, the Essen armour emerged triumphant. His article closes with

the following passage: "On the basis of our own proving-ground experience, therefore, we can justly claim to have possessed at the beginning of the war the best armour in the world, and which was, in particular, superior to the British. Moreover, it was the cheapest armour. One cannot resist the conclusion that the British have circulated unverified reports of comparative tests in order to 'puff' the British armour-plate firms, and to this end have belittled the German material."

That is, of course, the stock German reply to every foreign statement that reflects on the quality of German products, but it comes with an ill grace from those who before the war carried on a widespread propaganda against British naval material and lost no opportunity of publishing, both in their own press and in foreign journals, false and disparaging accounts of our ships, ordnance, armour-plate, and other equipment. All this was done with an eye to attracting foreign naval contracts to Germany. Admiral Rogge alleges that at the Battle of Jutland not a single British A. P. shell detonated after passing through the armour of a German ship. The value of his rejoinder as a whole may be judged by this one statement, which has been disproved by German accounts of the battle (e.g., von Hase) and by photographs taken on board German ships after the battle.

The *Marine Rundschau* prints the following paragraph about the four British battle cruisers of the super-*Hood* class, since cancelled: "These ships are not to have the anti-torpedo bulge outside the hull, as is the case in all post-war vessels above the light cruiser category. The ground for this decision may have been that an extension of beam due to a bulge of one or two metres in width would have necessitated docks larger than those now available. The reduction in speed resulting from the bulge has hitherto been accepted. The Admiralty maintain, however, that they have not given up the ideal of the anti-torpedo bulge, but have simply transferred it to the interior of the ship for reasons of convenience. Actually, this seems to show that British constructors have adopted the German and American principle of sub-division, that is to say, an imitation of the German torpedo bulkhead." It would be interesting to learn when and where the Admiralty made any such statement as that imputed to them.

In view of the mutinies which paralysed the high sea fleet during the war, one would suppose that the present German naval authorities would do their best to discourage politics on the lower-deck. It seems, however, that an exception is made in favour of political propaganda on reactionary and *revanche* lines, for the semi-official organ of the *Marine-Amt* warmly recommends, as suitable for the men's libraries, a new book entitled *The Guilt of the Enemy Alliance*. It would be interesting to know whether they are equally broadminded in respect of pacifist and socialistic literature.

In a series of interesting articles on "Austria-Hungary as a Sea Power," two former officers of the "K. and K. Marine" review the peculiar political and economic conditions that obtained in the dual monarchy and their effect on naval policy. It seems that in order to placate Hungary, a large share of Austrian naval contracts had to be allotted to Hungarian yards, although the latter were not really capable of undertaking such work. For instance, the battleship *Szent Istvan*, the cruisers *Helgoland* and *Nozara*, the *Tatra* class destroyers, and the 250-ton torpedo-boats of the *F*-class were ordered from the Danubius yard, Fiume, at a time when its resources were wholly unequal to the work involved. The result was serious delay in the completion of these vessels, notably the *Szent Istvan*. It was Hungarian opposition that prevented the building of railways in Dalmatia which would have enabled the navy to utilise the magnificent harbours of that coast as war bases. Hungary would do nothing calcu-

lated to diminish the importance of her own port of Fiume. Not until after the outbreak of war was her opposition to the Lika railway withdrawn, and then it was too late. The navy was thus tied to a single base, Pola, and was never able fully to develop a base on the southern coast, which would have been more advantageous from the tactical point of view.

With so many different nationalities assembled under one flag, it was inevitable that racial antagonisms should affect the personnel of the Austro-Hungarian navy. In one large ship, the authors state, no fewer than ten nationalities were represented. Croats from the coastal districts made excellent seamen and stokers; their intelligence was limited, but they were staunch and loyal, and did their duty almost to the very end. The Italian element was comparatively small; it was "not regarded as fully trustworthy, and was responsible for cases of sabotage, espionage, and high treason, chiefly the work of so-called 'intellectuals.'" Most specialist posts were filled by Germans, Czechs, or Hungarians, and the technical corps as a whole enjoyed a high reputation. The Czechs serving in the navy are described as having been the cause of most of the trouble, and it was they who finally seduced the Croats and Slovenes from their allegiance. The authors seem to think that had the German element predominated, the mutinous spirit would have been less in evidence; but this theory is hard to reconcile with what occurred in the German navy during 1917 and 1918. They pay a warm tribute to the character and professional attainments of Austro-Hungarian naval officers. Training at the Fiume Naval Academy was strict and very practical and the technical education was exceptionally thorough. Among the graduates of this academy there prevailed a spirit of comradeship in which racial jealousies had no part. Owing to the shortage of officers, however, it was necessary to reinforce the establishment with a large number of special-entry cadets, whose loyalty was not always beyond cavil.

But discipline and morale suffered most through the incursion of reserve officers from the merchant service at the outbreak of war. The majority of these, say the authors, were Italians or southern Slavs of a low standard of culture, whose seamanship was not to be compared with that of German merchant officers. They brought into the navy the demoralizing influence of racial animosity, and, being generally suspected, they could not be trusted with important appointments. It is claimed, nevertheless, that regarded as a whole, the personnel of the "K. und K. Marine" did their duty in an exemplary fashion, and that the navy, down to the final débâcle, was an intact, well-organized, and efficient striking force. "The personnel did everything possible to defend the coasts of the monarchy, and in general was imbued with a martial and enterprising spirit. In spite of difficulties arising from the conditions governing the personnel and of the fact that its ship material was far inferior in strength to that of any other Mediterranean power, the navy, thanks to its really good training, and not least to the devotion of its officers and men, was able to protect its own coastline all through the war, while making repeated attacks on the enemy's seaboard and assisting the land forces with such resources as it could spare."—*Naval and Military Record*, 1 March, 1922.

GERMAN MOTORSHIPS BUILDING.—Claiming that the accounts appearing in the daily and foreign press about the great number of motorships building in Germany are grossly exaggerated, a correspondent of *Hansa* asserts that the construction of only twenty-five such vessels of large type has been commenced in German yards since the beginning of 1919. These aggregate 120,000 gross tons and have all told engines of 55,000 horsepower.—*Nautical Gazette*, 4 March, 1922.

VESSELS REPURCHASED BY GERMANS FROM ALLIES.—The following is a partial list of the merchant ships which were surrendered by Germany to the Allies under the terms of the Versailles Peace Treaty and which have since been reacquired either by their former owners or other German shipping concerns:

<i>Name</i>	<i>Original Owner</i>	<i>Gross Tons</i>
<i>Adler</i>	North German Lloyd.....	1,304
<i>Bagdad</i>	German Levant.....	2,364
<i>Cap Polonia</i>	Hamburg So. Amer.....	20,597
<i>Claus Horn</i>	Horn.....	4,174
<i>Dora</i>	H. Schuldt.....	2,662
<i>Elbing</i>	Ger. Australian.....	4,884
<i>Erma Woermann</i>	Woermann.....	5,528
<i>Erika</i>	Ozean.....	2,666
<i>Florenz</i>	Slomann.....	1,533
<i>Fürst Bülow</i>	Hamburg Amer.....	7,638
<i>Habsburg</i>	Hamburg Amer.....	6,437
<i>Hannover</i>	North German Lloyd.....	7,305
<i>Hans Hemsoth</i>	Hemsoth Reederei.....	2,487
<i>Harald</i>	Emden Reederei.....	1,866
<i>Hedwig Heidmann</i>	Hugo Stinnes.....	2,084
<i>Helene</i>	M. Jebsen.....	1,237
<i>Henry Horn</i>	H. C. Horn.....	1,287
<i>Hersfeld</i>	Cont.-Reederei.....	4,487
<i>Ina Blumenthal</i>	Joh. Blumenthal.....	2,229
<i>Industria</i>	W. Kunstmann.....	2,199
<i>Isolde</i>	Balt. Reed. A. G.....	1,530
<i>Kypros</i>	Levant.....	2,210
<i>La Plata</i>	Hamburg Amer.....	4,032
<i>Lili Woermann</i>	Woermann.....	2,283
<i>Lisboa</i>	Oldenburg-Port.....	1,799
<i>Lotte Reith</i>	Reith.....	1,489
<i>Martha Woermann</i>	Woermann.....	2,282
<i>Muansa</i>	Ger. E. Africa.....	5,408
<i>München</i>	North German Lloyd.....	18,000
<i>Nitokris</i>	Kosmos.....	6,150
<i>Offenbach</i>	Ger. Australian.....	4,336
<i>Ostmark</i>	Hamburg Amer.....	4,399
<i>Parma</i>	F. Laeisz.....	3,091
<i>Paula Blumberg</i>	F. Laeisz.....	1,660
<i>Peiho</i>	F. Laeisz.....	2,118
<i>Passat</i>	Reed. F. Laeisz.....	3,091
<i>Pinnas</i>	Reed. F. Laeisz.....	1,946
<i>Rabat</i>	Hansa.....	4,678
<i>Radames</i>	Kosmos.....	4,756
<i>Regina</i>	W. Schuldt.....	1,297
<i>Rhenania</i>	W. Kunstmann.....	4,116
<i>Reichenfels</i>	Hansa.....	4,679
<i>Roma</i>	German Levant.....	2,606
<i>Rudia</i>	Hamburg Amer.....	6,605
<i>Rügen</i>	Bräulich.....	1,854
<i>Santa Inés</i>	Hamburg So. Amer.....	5,199
<i>Schwan</i>	Argo.....	1,212
<i>Schwarzenfelde</i>	Fuhrmann.....	3,837
<i>Schwinze</i>	Bugs. Reed. Berg. Ges.....	2,646
<i>Seydlitz</i>	North German Lloyd.....	8,008
<i>Spezia</i>	Hamburg Amer.....	3,786
<i>Svionio</i>	Kunstmann.....	2,797
<i>Tarpenbeck</i>	Knöhr & Burchardt.....	2,118
<i>Tucuman</i>	Hamburg So. Amer.....	4,702
<i>Turpin</i>	Roland.....	5,152
<i>Volga</i>	Neue Dampf. Co.....	1,098
<i>Wigbert</i>	Hamb.-Bre. Africa.....	3,667
<i>Woglinde</i>	Cont.-Reederei.....	4,487
<i>York</i>	North German Lloyd.....	8,909
Total (59).....		239,012



## GREAT BRITAIN

**REDUCTION OF THE NAVY.**—A statement by the First Lord of the Admiralty explanatory of the navy estimates for 1922-23, was published on Monday in advance of the estimates themselves, which are shortly to be laid before Parliament. This document shows that very substantial reductions are to be made in naval expenditure during the coming financial year as a result of the Limitation Treaty entered into at Washington. It is appropriate that Lord Lee of Fareham, to whose efforts the success of the Conference was due in great measure, should be sponsor for the first navy estimates that reflect the decisions reached at that gathering. Some twelve months ago, shortly after taking up his appointment as First Lord, he expressed the hope that "as a result of frank and friendly discussion with the principal naval powers" it would be possible "to avoid anything approaching to competitive building, either now or in the future." As he observes in his present statement, "that anticipation has now been largely realised, and a new era of hope ushered in for an impoverished and war-weary world."

The reduction to be effected in naval disbursements during 1922-23 is shown by the following comparison with the estimates for the current fiscal year:

	Gross £	Net £
1921-22 .....	91,554,869	82,479,000
1922-23 .....	68,950,000 (approx.)	64,883,700
Reduction .....	£22,604,869	£17,595,300

The "one-power standard" of naval strength, which has been adopted by the government, connotes the maintenance of a navy not inferior in strength to that of any other power. According to Lord Lee, the Admiralty has not only framed its requirements in conformity with the new standard, but has gone further in accepting drastic economies, and consequent risks, which could only be justified on the assumption that the British fleet will not be engaged in any great war for many years to come. The Admiralty adds that on purely naval grounds such an assumption could not be justified, but as both the financial and the international situation call for an exceptional response, it has made it, realising, however, that in this matter a very grave responsibility is imposed upon it. The principal economies which it is proposed to effect may be summarised as follows:

(a) The scrapping of twelve capital ships, in addition to the eight recently sold for breaking up, and the maintenance of only fifteen in full commission, as compared with thirty-eight in March, 1914.

(b) Further reductions in the destroyer flotillas of the Atlantic fleet, involving the maintenance in full commission of only forty boats. One of the present flotillas is to be reduced to two-fifths complement, and twenty-three destroyers of the local defence flotillas are to be placed in reserve.

(c) Of the eighty-five submarines now on the Navy list, twenty-seven are to be scrapped. These latter, it is understood, comprise all the remaining *K* and *E* boats and most of the *R* class.

(d) The abolition of two of the Home Commands, viz., Coast of Scotland and Western Approaches.

(e) A reduction of the personnel of the fleet by more than 20,000 officers and men. In consequence of this very drastic cut it will be necessary to diminish the ship's company of each vessel of the Atlantic fleet by fifteen and seven-tenths per cent. The present complement per ship is

higher than the pre-war establishment, war experience having shown the desirability of increasing the number of officers and men borne in each vessel.

(f) The discharge of over 10,000 men from the royal dockyards, and a drastic reduction of civil staffs at the Admiralty and other establishments. Rosyth is the dockyard principally affected by this decision. In future it will be reserved for the docking of such ships as, by reason of their dimensions, cannot be docked at the southern yards, and for certain refitting work in connection with these vessels. Chatham and Pembroke are to be retained as royal yards—the first because it has small docks and storehouse accommodation with which the fleet cannot well dispense, and the second because its abolition would deprive the inhabitants of the town of Pembroke of their chief source of livelihood and thus create so much local distress that any direct saving in national expenditure would be more than neutralised by the necessity of granting relief. The Gibraltar yard is to be reduced, the annual saving at this establishment being estimated at £58,000. As the Admiralty points out these dockyard economies have been determined upon solely in the interests of national economy, and without regard to the requirements of the fleet. The result will be to delay and restrict a great deal of important ship construction and reconstruction, as well as repair and refitting work on vessels of the fleet. It is obvious that the plan of so enlarging the main slips at Portsmouth and Devonport as to enable those yards to undertake the building of post-war capital ships has been postponed indefinitely.

For the past month or two it had been persistently rumoured that the two new battleships which the Naval Limitation Treaty authorises this country to build would not be proceeded with. Fortunately, these rumours are now disproved, the First Lord stating that the vessels in question will be laid down early in 1923. The delay is probably due to the necessity of recasting their designs in harmony with the displacement limit of 35,000 tons specified by the Treaty. It is no longer a secret that the four battlecruisers authorized last year, but subsequently cancelled, were to have had a displacement of about 47,000 tons. In place, therefore, of the 188,000 tons of new construction contemplated last year, we are to build only 70,000 tons. Had the four battlecruisers been proceeded with the coming year's vote for contract shipbuilding would have amounted to £10,557,800, whereas it is actually limited to £300,000. This is, of course, the largest individual item of reduction directly attributable to the Washington Conference. Vote 9—Naval Armaments—shows a cut of £1,837,200 as compared with the last estimates. This money is to be saved by deferring the overhaul of and reconditioning of surplus stocks of ammunition, by keeping smaller reserves of mines and depth charges, and by delaying the issue of new armour-piercing shell. Economies of this kind would be inadmissible were the international situation less promising, but as it is they cannot be said to entail serious risk. Expenditure on naval works is to be reduced by £1,573,600, the Admiralty having arranged to proceed only with those undertakings the completion of which is either essential or would involve less outlay than the liquidation of the contracts. A further large saving is to be made in regard to oil fuel and coal, economies under this head reaching the impressive total of £5,386,500. It will mean cutting down the fleet's fuel allowance to the lowest possible limit, the laying up of several of royal fleet auxiliary ships normally employed on fleet fuelling duty, and the restriction by £500,000 of the development in 1922-23 of the Navy's oil fuel depôts at various bases abroad. The Lords of the Admiralty have not taken this step "without considerable anxiety, which will, they believe, be shared by all who realise the extent to which the mobility of the chief units of the British fleet is restricted under existing conditions, owing to the absence of the necessary oil-fuelling bases."

The votes for education and scientific services show between them a reduction of £122,000. The Admiralty—wisely, as we think—has declined to accept the drastic cut in expenditure on scientific and research work that the Geddes Report recommended. Such a measure would, it feels, “be inexcusable at a time when we are forced to rely more and more on the hope that the Navy will make up in quality of personnel and superiority of technique for the lead that has been surrendered in respect of matériel. Of all the lessons of the war, none stood out more clearly than the importance, and the previous inadequacy, of scientific research, and the Admiralty is convinced that the measures which it has taken are not more than sufficient to maintain research and experiment on a sound and at the same time very moderate and economical basis.”

The foregoing review of the First Lord's statement shows that the Admiralty has made a determined attempt to cut down expenditure on the naval service. It is clear from his observations that further economies can be effected only at the cost of sacrificing efficiency to such an extent that the Navy would be no longer competent to carry out its duties in a national emergency.—*The Engineer*, 17 March, 1922.

NAVY ESTIMATES.—The navy estimates for 1922-23, “prepared on the assumption that the Naval Treaty concluded at Washington will be effectively ratified by all the signatory powers,” amount to the grand total of £64,883,700, as compared with £82,247,900 for the current year.

The numbers provided for are: Officers, seamen, boys, and marines 118,500, and coastguard and marine police 2,900, but the first number, it is stated, will be reduced to approximately 98,500 as soon as practicable.

The votes for effective services total £54,774,200, a reduction of nearly £21,000,000, the result of the Washington Conference and concurrent administrative economies.

The non-effective votes have increased by £3,000,000, almost entirely due to provision for pensions and retiring gratuities to the great number of officers, men and dockyard employés (amounting to over 30,000), who are to be reduced this year.

It is stated that the King has approved of the giving up of the royal yacht *Alexandra* in order that the cost of her maintenance, about £26,000 a year, may be saved. The Admiralty yacht *Enchantress* is also being given up. Rosyth will be specially affected by dockyard reductions, as it has been decided to place this establishment on the footing of a docking yard.—*Naval and Military Record*, 15 March, 1922.

SUPER-HOODS TO BURN COAL.—It is reported that one of the features in the design of the two new battleships which are being laid down instead of the four super-Hoods is that they will be fitted to burn coal as well as oil. There is no intention, however, to banish oil fuel from the Navy altogether, and the ships will only use their coal for cruising at reasonable speed. When extreme speed is desired the oil-boilers will be lit up and the extra steam raised very much quicker than would be possible with coal.—*Engineering and Industrial Management*, 2 February, 1922.

DEFENCE MINISTRY SHELVED.—In view of the tremendous importance of the subject, the government have wisely decided to let the question of uniting the Navy, Army, and the Air Force under a Minister of Defence stand over for the time being. This announcement will be hailed with relief by the vast majority of those who take an intelligent interest in the welfare and efficiency of the fighting services. Except that now there are three distinct services to be considered instead of the two that were then in existence, the arguments which the Hartington Commission brought

forward against the creation of a Ministry of Defence are just as cogent and apposite today, as they were a generation ago. It was pointed out that while the position of the Minister of Defence would necessarily be a very powerful one, his decisions could never be final, since they would be liable to be overruled either by the Cabinet or the Prime Minister. Whatever its faults may be, the present system is based upon rational principles which, on the whole, have worked well in practice. It enables the Cabinet or the Prime Minister to hold the balance between the Admiralty and War Office claims on the one hand and financial exigencies, as represented by the Treasury, on the other.—*Naval and Military Record*, 15 March, 1922.

**SALE OF IMPERIAL AIRSHIPS.**—General regret has been caused by the announcement that in spite of the efforts made to utilise the existing British airships for experimental Empire services, or alternatively to employ the airships for test work and the accumulation of data on airship design and construction, the Air Ministry has decided to dispose of the existing fleet and material, together with certain airship stations. It is not believed that the disaster to the *Roma* has influenced this decision, which is based mainly on a desire of economy, and the inability of Dominion governments to co-operate in the proposed scheme for airship services. The airships which are to be offered for sale are the *R-80*, *R-33*, *R-36*, and the ex-German *L-77*, which are completed, and the partially built *R-37*. There is a considerable quantity of airship material, and the stations which will be included in the deal are those at Pulham and at Cardington, near Bedford. It is difficult to imagine where the Disposals Board will find purchasers in view of the failure of the home government to obtain the support of Dominion governments for restricted airship services, and it is probable that it will be necessary to look abroad for buyers.—*The Engineer*, 10 March, 1922.

**SCRAPPING SUBMARINES.**—There will not be much surprise in the Navy that the Admiralty have decided to scrap the Material Reserve of submarines, which is formed of almost the whole of the *E*, *G*, and *R* types. The fact that these craft were in the Material Reserve was indicative of their utility having come to an end, although this is not to say that the vessels were past service if they had been needed. The three *G* boats had been for some time on the disposal list, and were long ago regarded as of no further value; but the *E* and *R* submarines were all excellent craft, built during the war under the emergency war programme.

The *E* boats were a particularly fine type, and proved most satisfactory. They performed splendid work almost throughout the war, and their activities were so constant that no fewer than twenty-seven of them were lost in action. The thirteen vessels remaining, with the exception of one used as a target vessel with the Submarine School, are in the Material Reserve. The *R* boats were a product of the anti-U-boat campaign. They were all launched and finished in 1918, and were described as "submarine destroyers of submarines." Their outstanding features were their abnormal submerged endurance, and the very unusual quality of travelling faster below the water than on the surface.—*Naval and Military Record*, 8 March, 1922.

**SWIMMING TESTS.**—To standardise and improve existing instructions as regards swimming tests, a fleet order states, the following revised regulations are issued:

There will be two tests, viz.: Provisional test—to be carried out in a swimming bath. Standard test—to be carried out in the open sea. The

"provisional test" is only to be employed when open sea facilities are not available. In each case in order to pass the test every man is to swim forty yards in a duck suit in deep water after which he is to be able to keep himself afloat for three minutes.

Qualifications in both tests are to be awarded as follows: "Fair."—Meaning that the man only just managed to pass and should be given more practice. "Good."—An average swimmer. "Very Good."—A strong swimmer. These qualifications are intended to assist officers at sea to recognize backward swimmers.

Notations on service certificates are to be as follows: "Passed Provisional Test (P.P.T.)," followed by qualification and date; or "Passed Standard Test (P.S.T.)," followed by qualification and date; or "Cannot Swim," and date. Every effort is to be made to ensure that all officers and men pass the standard test.—*Naval and Military Record*, 22 February, 1922.

**A REDUCED FLAG LIST.**—The announcement on Monday that the active list of flag officers in the Royal Navy is to be cut down from ninety-two to seventy-seven does not come as a surprise. The necessary steps to inaugurate the reduction will, it is understood, take effect in August. It is not yet clear whether this means that the total number of flag officers must come down to seventy-seven by that month, or whether a stop will then be made to promotions to flag rank until the list is down to the new establishment. The latter course would not be in the best interests of the Service, for it would have the effect of stagnating all promotions to rear-admiral for over twelve months, with corresponding influence on the lower grades. The better way, and the one which seems most likely to be adopted, would be for those officers whose prospects of employment are remote to retire voluntarily between now and August. Several admirals have since the armistice, shown their patriotism by retiring voluntarily in order to facilitate the promotion of those junior to them. If fifteen more were to do so now it would keep up the flow of promotion, and would relieve the Admiralty of the necessity for retiring compulsorily, by order in council, those officers who in August will be surplus to establishment.

The sequel to this cut in the admirals' list is no doubt being very fully considered by the Admiralty, for the problem in its relation to employment, retirement, the flow of promotion, and the age of officers is a very complex one. We are now getting back to the flag establishment of the early nineties, but whereas there were then only 168 captains and 236 commanders looking forward to promotion, there are now 356 captains and 557 commanders, or more than double the numbers. It is true that during the last twenty years the regulations for compulsory retirement for age and non-employment have been made more stringent, thus causing a greater flow of promotion to flag rank, but the effect of this will be neutralised when there are fewer vacancies to fill. We cannot afford, moreover, to retard advancements to rear-admiral, because the average age of the flag officers would soon become higher and higher, and we should be back in the bad old days when admirals never got their flags until they were fifty, and never handled a fleet until they were sixty. The circumstances of the moment seem to point to the necessity in the early future of a bold retirement scheme to clear the captains' and commanders' lists, and of a reduction of the ages at which flag officers must retire.—*Army, Navy, and Air Force Gazette*, 25 February, 1922.

**AMOUNT REALIZED BY BRITAIN FROM SALE OF GERMAN SHIPS.**—Lord Inchcape's report on the sale of former German ships on behalf of the

Allied reparations commission, made public in London last week, shows that 418 ships, aggregating 2,500,000 tons, were sold for £20,076,216 (normally \$100,381,080). Expenses in connection with their sale amounted to twelve and one-half per cent.—*Nautical Gazette*, 11 March, 1922.

### JAPAN

NAVAL BASES IN THE PACIFIC.—According to reports which have lately appeared both in American and Japanese newspapers, the closing stages of the negotiations at Washington were marked by acute differences of opinion with regard to the problem of fortifications in the Pacific. At one time, it is stated, the discussion threatened to end in a complete deadlock, which might have wrecked the whole scheme of naval limitation, for the American government attached particular importance to this question of fortified bases and felt that its settlement was a condition precedent to the maintenance of peace. A study of Article 19 of the Naval Treaty shows that a broad belt of the Pacific Ocean has been virtually neutralized by the agreement reached in respect of island fortifications. America has agreed not to proceed with defensive works at any point in her insular territories west of Hawaii, while Japan, on her part, promises to discontinue the erection of batteries and naval harbours at the outlying islands of her empire. The British Empire, also, pledges itself not to create any new fortifications in the Pacific except such as may be contemplated at points adjacent to the coasts of Canada, Australia, and New Zealand. Such, in broad outline, was the agreement reached after protracted and at times somewhat critical negotiations.

Japan, it seems, wished to exempt various islands of hers, particularly the Bonins and the Luchus, which, she contended, were so near to her coasts as almost to represent an interior line of defense. This may be true of the Luchu group, but it scarcely applies to the Bonins, which lie about 500 miles to the southeast of Japan proper. Nor is it easy to comprehend why Japan should have made such a point of excluding the Bonins, seeing that these islands are already well defended, the work having been completed only a few months since. It is not as though the agreement demanded the razing of defences already built; it merely provides that the *status quo*, at the signing of the treaty, is to be maintained, so that even if the Bonins or any other islands embraced by the compact had just been equipped with forts and guns of the most modern and powerful type, there is nothing to prevent the maintenance of such works in a state of complete efficiency. It has been suggested in America that Japan's reluctance to accept this particular portion of the agreement was due not to any qualms about the safety of the Bonins or the Luchu Islands, but to an idea that she might eventually find it expedient to convert into naval bases one or more of the ex-German South Sea Islands, of which she is mandatory, and therefore desired to retain freedom of action in this matter. The American government, however, pointed out that, unless the *status quo* principle was accepted, they would have no alternative but to fortify the Philippine and other Western Pacific islands on a large scale, a step that would have brought the American fleet within easy striking distance of Japan, this being a contingency which the latter was, of course, most anxious to avert. This argument seems to have clinched the business, for Japan made no further objection to the fortification clause of the treaty.

It has since been suggested in the American Senate that Great Britain has gained an unfair advantage by the exclusion of Singapore from the non-fortification compact. A great naval base at this point would, it is asserted, enable the British fleet to dominate the waters of the Far East, and especially those areas from which the American Navy will henceforth

be cut off owing to lack of base facilities. Considering the almost identical aims of British and American policy in the Far East and the absence of any cause of friction between them, the strategic value of Singapore should be to Americans a matter of friendly interest rather than misgiving; but in any case there is no reason to suppose that this port will now be developed into a great naval station. As Mr. Hughes, the Australian Prime Minister, said recently, the question of providing a suitable base in the Pacific for the Imperial Navy was discussed at the Conference in London last summer, and a decision was then reached to establish such a base, but not at Singapore. The point actually selected has not been divulged, but, in view of the present shortage of money and the suspension of competitive shipbuilding it is most improbable that the project will materialize. We note that a Japanese paper, the *Mainichi*, professes to have discovered the venue of what would have been the British Empire's great naval station in the Pacific, namely, Geelvink Bay. The *Mainichi*, however, has overlooked the fact that Geelvink is situated, not in British territory at all, but in Dutch New Guinea. It is just possible that Japanese and American experts have exaggerated the importance of this question of naval bases in the Pacific. In that ocean of magnificent distances, fixed bases would doubtless play an important part in war, but there is nothing in naval history to justify the assumption that a large elaborately-equipped and well-defended harbour within the zone of operations is indispensable to the successful conduct of a campaign. It is a significant fact that in every naval war of modern times the victorious fleet had improvised its main-war base, while the defeated side invariably operated from a large and well-nigh impregnable stronghold, furnished with every possible facility. Had the delegates at Washington been more familiar with naval history, it is doubtful whether they would have spent so much time in discussing a question which, after all, would probably prove to be of secondary importance in the event of war occurring in the Pacific.—*Naval and Military Record*, 15 March, 1922.

**AEROPLANE MARKINGS IN JAPAN.**—The mark of recognition for the aeroplane is a sun in red, displayed at each end of the upper surface of the upper wing and of the under surface of the lower wing, as well as on each side of the body (or on each side of the frame if the machine is of the frame system). The name of the aeroplane is displayed above the number on the rudder, and the number is displayed in Arabic figures on each side of the rudder, or on each outer side (if there are two or more rudders) and on the under surface of the lower wing with its head to the front.—*Aerial Age Weekly*, 13 March, 1922.

**REDUCTION OF JAPANESE ARMAMENTS.**—Reports just to hand indicate that as a result of the decision to reduce armaments, about 60,000 workers, including men employed in naval and military establishments, are to be discharged. The number of hands on the pay roll of the Japanese Imperial Dockyards is about 80,000, but it is hoped to find employment for a considerable percentage of them for some years in the breaking up of the warships, which are to be scrapped under the Washington agreement, and in the building of auxiliary vessels which are authorized by the naval pact.—*The Engineer*, 17 February, 1922.

**N. Y. K. WITHDRAWS ITS BEST LINERS FROM SEATTLE RUN.**—As a result of the competition of the Shipping Board's fast combination passenger and cargo carriers operated by the Admiral Line on the Seattle-Yokohama run, the Nippon Yusen Kaisha announces the withdrawal from that service of its 10,500-ton liners *Katori Maru*, *Kashima Maru*,

*Suwa Maru*, and *Fushimi Maru*. The withdrawn vessels will be employed on the European route and are to be replaced by the smaller 6,000-ton ships *Kaga Maru*, *Iyo Maru*, *Shidzuoka Maru*, and *Yokohama Maru*. The new schedule will go into effect in east-bound travel with the sailing of the *Kaga Maru* from Yokohama, March 17, and westbound with the sailing of the same ship from Seattle in May.

New minimum fares from Yokohama or return and to Hong Kong or return will range from \$210 to \$275 as compared with \$300 and \$375 on the larger vessels. This is a reduction of approximately thirty per cent.

According to an announcement from the Seattle office of the Nippon Yusen Kaisha, the 6,000-ton ships will ply in the Seattle-Oriental service only temporarily and are to be replaced by a new type of vessel especially designed for this service. These new ships will be larger, faster, and more luxurious than any steamers hertofore calling at Seattle.—*Nautical Gazette*, 4 March, 1922.

POLAND AND JAPAN LINE.—According to a Polish newspaper, the Nippon Yusen Kaisha contemplates establishing a regular shipping connection between Poland and Japan via Danzig. Toward the end of February, it is stated, the first shipment of Polish goods will be despatched to Japan, and in the event of the experiment proving successful a regular Danzig-Japan Line will be started.—*Nautical Gazette*, 25 March, 1922.

## UNITED STATES

NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR  
WASHINGTON, D. C.

March 10, 1922

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—Progress as of February 28, 1922

Type Number and Name	Contractor	Per Cent of Completion			
		March 1, 1922		Feb. 1, 1922	
		Total	On Ship	Total	On Ship
BATTLESHIPS (BB)					
45 <i>Colorado</i> .....	New York S. B. Cpn.....	89.6	88.7	87.9	86.8
47 <i>Washington</i> .....	New York S. B. Cpn.....	75.9	70.3	75.3	69.4
48 <i>West Virginia</i> .....	Newport News S. B. & D. D. Co.....	74.	70.2	73.	69.2
49 <i>South Dakota</i> .....	New York Navy Yd....	38.5	31.6	38.5	31.6
50 <i>Indiana</i> .....	New York Navy Yd....	34.7	27.2	34.6	27.1
51 <i>Montana</i> .....	Mare Island Navy Yd....	27.6	19.	27.6	19.
52 <i>North Carolina</i> .....	Norfolk Navy Yd....	36.7	27.1	36.7	27.1
53 <i>Iowa</i> .....	Newport News S. B. & D. D. Co.....	31.8	27.4	31.5	27.1
45 <i>Massachusetts</i> .....	Beth. S. B. Cpn. (Fore River).....	11.	4.3	11.	4.3
BATTLECRUISERS (CC)					
1 <i>Lexington</i> .....	Beth. S. B. Cpn. (Fore River).....	33.8	24.2	33.2	23.4
2 <i>Constellation</i> .....	Newport News S. B. & D. D. Co.....	22.7	19.5	22.3	19.1
3 <i>Saratoga</i> .....	New York S. B. Cpn.....	35.4	28.	33.7	26.7
4 <i>Ranger</i> .....	Newport News S. B. & D. D. Co.....	4.	1.5	4.	1.5
5 <i>Constitution</i> .....	Philadelphia Navy Yd....	13.4	8.4	13.3	8.3
6 <i>United States</i> .....	Philadelphia Navy Yd....	12.1	7.1	12.	7.



## SCOUT CRUISERS (LIGHT CRUISERS CL)

4 <i>Omaha</i> .....	Todd D. D. & Const. Cpn.	99.2	94.7	99.2	94.3
5 <i>Milwaukee</i> .....	Todd D. D. & Const. Cpn.	99.2	87.	94.	86.5
6 <i>Cincinnati</i> .....	Todd D. D. & Const. Cpn.	88.1	81.8	88.	81.6
7 <i>Raleigh</i> .....	Beth. S. B. Cpn. (Fore River)	64.2	46.6	63.7	45.6
8 <i>Detroit</i> .....	Beth. S. B. Cpn. (Fore River)	81.	68.1	79.1	64.8
9 <i>Richmond</i> .....	Wm. Cramp & Sons Co.	87.	80.	85.	79.
10 <i>Concord</i> .....	Wm. Cramp & Sons Co.	83.	77.	82.	75.
11 <i>Trenton</i> .....	Wm. Cramp & Sons Co.	58.	46.	57.	46.
12 <i>Marblehead</i> .....	Wm. Cramp & Sons Co.	47.	33.	47.	33.
13 <i>Memphis</i> .....	Wm. Cramp & Sons Co.	40.	26.	40.	26.

## AUXILIARIES

Repair Ship No. 1, <i>Medusa</i> (AR1).....	Puget Sd. Navy Yd.....	77.6	69.8	75.9	66.6
Dest. Tender No. 3, <i>Dobbin</i> (AD3).....	Phila. Navy Yd.....	68.1	67.8	67.5	67.2
Dest. Tender No. 4, <i>Whitney</i> (AD4).....	Boston Navy Yd.....	50.9	42.1	49.6	40.4
Sub. Tender No. 3, <i>Holland</i> (AS3).....	Puget Sd. Navy Yd.....	21.5	5.5	21.5	5.5

## PATROL VESSELS

Gunboat No. 22, <i>Tulsa</i> (PG22).....	Charleston Navy Yd.....	72.3	60.	72.	59.
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## DESTROYERS

*339 <i>Trever</i> .....	Mare Island Navy Yd....	99.8	99.8	99.6	99.6
340 <i>Perry</i> .....	Mare Island Navy Yd....	90.7	90.7	87.7	87.7
341 <i>Decatur</i> .....	Mare Island Navy Yd....	84.3	84.3	83.3	83.3

Destroyers authorized but not under construction or contract

(12) Nos. 348 to 359 inclusive.

\*Ready for commissioning.

There are three fleet submarines and thirty-eight submarines under construction.

There are six fleet submarines and one submarine authorized but not under construction nor contract.

FINISH "WEST VIRGINIA" UNDER NAVAL TREATY.—Secretary Denby today ordered work on completion of the battleship *West Virginia*, building in the yards of the Newport News Shipbuilding and Dry Docks Company, resumed, that vessel having been selected for completion instead of the battleship *Washington*, under the terms of the Naval Limitation Treaty.

The special naval board found the *West Virginia* to be eighty per cent finished, as compared to the sixty-nine per cent completed status of the *Washington*. Work on the *Washington* in the yards of the New York Shipbuilding Company at Camden, N. J., will remain suspended, as is the case with other new battleships and battlecruisers which are slated to be scrapped or converted when the treaty has been ratified and ratifications have been formally exchanged.

The battleship *Colorado* and the *West Virginia* will be the vessels to be added to the fleet as the equivalent in the American Navy for Japan's retention of the battleship *Mutsu*.

The Navy Department has not reached a decision as yet as to which of the three battlecruisers nearest to completion are to be converted into airplane carriers.—*Philadelphia Public Ledger*, 17 March, 1922.

BACKS ARMY AND NAVY.—President Harding is confident that Congress will not enact legislation that will cripple either the United States Navy or the Army. This was made known at the White House following the cabinet meeting and a conference with Representatives Anthony of Kansas and Sisson of Mississippi (Democrat), members of the subcommittee

of the appropriations committee in charge of the army appropriation bill, and an earlier conference with General Pershing. Mr. Anthony, after his interview with the President, said that he believed the House committee would give very careful consideration to the views held by the President regarding reductions in the Army. The President had previously talked with members of the navy committee.

The President, it is said, feels that just at the moment the country, and its temper is reflected in Congress, is passing through the acute stage of a disposition to cut everything to pieces. Mr. Harding realizes that there is a strong and well justified sentiment in Congress to reduce expenditures for the Army and Navy, and he is in cordial sympathy with the disposition in that direction, but he does not approve of cutting appropriations to the point where the Navy and Army could not function properly. He has assumed that there will be further reductions made in the Army, but he would oppose any reduction that would bring the Army to less than 130,000 men until the national guard has reached the stage where it can be turned to in an emergency. Mr. Harding believes that while the whole world is passing through a stage of social and political unrest, the situation is hopeful, particularly in America. He does not believe, however, that the time has come when this country can regard itself as perfectly secure without armed forces.

In his recent address to the joint session of Congress he spoke of the merchant marine as the second line of defense, and while he does not desire to stress that viewpoint, he believes, it is understood, that if America had a well-established, reasonably swift fleet of merchant ships, it would be of very great advantage to our naval defense.

Both the President and the Secretary of the Navy, it is understood, are aware that there have been many extravagances as a result of the war. So many subsidiary vessels were built during the war that there has been a natural temptation to place them in commission upon completion, and there have been literally hundreds of destroyers that have been operated at a very great expense entirely unnecessarily.

That there will be numerous changes made in the Army personnel is regarded as inevitable. The administration's view, it is understood, is that as at present organized the army is somewhat topheavy in the matter of commissioned officers. So many promotions have been made that there are comparatively few men of the lower ranks left.

As for the Navy, it is thought that there will be a material reduction of the personnel, but the President has made it known that he is not in favor of a reduction below 80,000.—*Washington Post*, 4 March, 1922.

**NAVY YARDS WOULD BE COSTLY REPAIR PLANTS.**—In a circular to its members, the American Marine Association calls attention to the fact that the shipbuilding industry is being menaced by an attempt to enact legislation whereby the navy yards of the country will be permitted to bid against private shipyards for reconditioning government-owned merchant vessels.

If the contemplated action is taken, it means that private yards would get only the work that the Navy could not handle; because it would be a perfectly simple matter for the government to underbid any price submitted by any private yard. As is well known, government operations never have regard for all of the fixed overheads of a private corporation; while on the other hand it is an easy matter for any department to offset its operating losses through deficiency appropriations or transfer of funds from one account to another.

Thus a bid by a navy yard for the reconditioning or building of a ship would mean absolutely nothing except additional taxes to an ex-

tent far greater than the difference between the government bid and that of a privately-owned yard; because in no event would the actual work be done under government supervision at anything like the cost to a well-organized corporation.

Again, there is nothing in the argument advanced by some members of Congress, that if the government-owned vessels were to be reconditioned at the navy yards it would keep several thousand men at work who would otherwise become idle through the agreement to reduce and restrict the number of naval capital ships. It is true that if the government were to do the work more men would be employed than were the contract given to a private yard; but aside from that, it takes just so many men to do a given piece of work and it would simply mean that the workmen of one centre would suffer at the expense of those at another.—*Nautical Gazette*, 11 March, 1922.

**BOARD REJECTS ALL BIDS.**—The Shipping Board rejected on Monday all of the bids received for its 1,490 steel vessels recently announced for sale. Chairman Lasker said that bids were received for about 100 ships, which were so low as not to warrant serious consideration. He also characterized the bids as facetious.

"The results obtained by the advertisement proved conclusively," Mr. Lasker said, "that there is no market for shipping board vessels, even of the most approved types, at this time. Our reports would indicate that there is not more than \$15,000,000 in the American market available for investment in ocean-going ships, where £45,000,000 is said to be available for a like purpose in the United Kingdom."—*Nautical Gazette*, 25 March, 1922.

**"COLUMBIA" SOLD TO ADMIRAL LINE FOR \$1,250,000.**—The fast triple screw turbinéd passenger and cargo steamer *Columbia*, formerly the *Great Northern*, has been sold by the Shipping Board to the Admiral Line for \$1,250,000. This is \$250,000 more than the amount paid for the *Northern Pacific*, the sister ship of the *Columbia*, which was recently destroyed by fire. The fact that the Navy made improvements to the *Columbia* while it had the vessel in its service accounts for this increase in price. It is understood that the *Columbia* will be renamed *H. F. Alexander* and that she will be reconditioned at the yard of the Sun Shipbuilding Company, Chester, Pa.—*Nautical Gazette*, 11 March, 1922.

SEAGOING STEEL TONNAGE ACCORDING TO YARDS  
Building or Contracted for in the United States, March 1, 1922

SHIPYARD	PRIVATE ACCOUNT		U.S.S.B. ACCOUNT		TOTAL	
	No.	Gross	No.	Gross	No.	Gross
Bethlehem S. B. Corp., Ltd.						
Balt. D. D. Plant.....	1	4,000	..	..	1	4,000
Spar. Point Plant.....	2	27,000	1	10,500	3	37,500
Union Plant.....	2	27,000	..	..	2	27,000
Federal S. B. Co.....	1	6,000	..	..	1	6,000
Hanlon D. D. and S. B. Co.....	1	1,500	..	..	1	1,500
Merchant S. B. Corp.....	2	15,600	..	..	2	15,600
New York S. B. Corp.....	2	13,600	..	..	2	13,600
Pusey and Jones Co.....	2	5,420	..	..	2	5,420
Sun S. B. Co.....	1	9,000	..	..	1	9,000
	—	—	—	—	—	—
Total.....	14	109,120	1	10,500	15	119,620

—*Bulletin of the American Bureau of Shipping*, March-April, 1922.

FEBRUARY SHIPBUILDING OUTPUT IN DETAIL.—The Bureau of Navigation Department of Commerce, reports 39 sailing, steam, gas, and unrigged vessels of 28,359 gross tons built in the United States and officially numbered during the month of February, 1922, as follows:

	Atlantic and Gulf		Pacific		Great Lakes		Western Waters		Total	
	No.	Gross	No.	Gross	No.	Gross	No.	Gross	No.	Gross
<b>WOOD</b>										
Sailing.....	4	581	..	....	..	....	..	....	4	581
Steam.....	..	....	..	....	..	....	1	115	1	115
Gas.....	19	628	3	49	1	17	..	....	23	694
Unrigged.....	2	1,137	1	271	..	8	..	....	3	1,40
Total.....	25	2,346	4	320	1	17	1	115	31	2,798
<b>METAL</b>										
Sailing.....	..	....	..	....	..	....	..	....	..	....
Steam.....	2	28,611	..	....	..	....	4	5,644	6	34,255
Gas.....	..	....	..	....	..	....	..	....	..	....
Unrigged.....	..	....	..	....	..	....	2	1,306	2	1,306
Total.....	2	28,611	..	....	..	....	6	6,950	8	35,561
<b>TOTALS</b>										
Sailing.....	4	581	..	....	..	....	..	....	4	581
Steam.....	2	28,611	..	....	..	....	5	5,759	7	34,370
Gas.....	19	628	3	49	1	17	..	....	23	694
Unrigged.....	2	1,137	1	271	..	....	2	1,306	5	2,714
Grand Total	27	30,957	4	320	1	17	7	7,065	39	38,359

The above total includes 24 rigged vessels of 6,300 gross tons and 3 unrigged vessels of 1,960 gross tons, total 27 vessels of 8,260 gross tons built in years previous to 1922.

The largest vessels built during the month were the steel cargo carrier *Bethore* of 14,899 gross tons and the combination passenger and cargo carrier *Pan America* of 13,712 gross tons.—*Nautical Gazette*, 18 March, 1922.

PROPOSED U. S.-CHINESE S. S. Co.—It is reported from Washington that a new steamship company, financed by American-Chinese capital, is negotiating with the War Department for the purchase of the latter's surplus transports. The new company is said to be contemplating a service from Pacific Coast to Chinese ports, with feeder lines to the Straits Settlements, and to be figuring on the Army transports *Sheridan*, *Dix*, *Thomas*, *Sherman*, and *Logan*, which will soon be offered for sale.—*Nautical Gazette*, 18 March, 1922.

"GLORY OF THE SEAS" NO MORE.—The old clipper ship *Glory of the Seas*, which thirty-five years ago set a record for "windjammers" between San Francisco and Australia, is being broken up following the discovery that barnacles have eaten into her hull beyond repair.

The stout old ship was built at the famous Donald McKay yards in Boston, Mass., in 1869, and since then has called at most of the important ports of the world. One of her fast voyages was that made in 1875, from San Francisco to Sydney, N. S. W., in thirty-five days. Some years ago the *Glory of the Seas* was purchased by a Tacoma fish company and was put in the service between Puget Sound and Alaska. She is being broken up for what metal she holds.—*Nautical Gazette*, 11 March, 1922.

CONVERSION OF BATTLECRUISERS INTO AIRPLANE CARRIERS.—To insure to the United States the benefits conferred by Article IX of the Five-Power Naval Treaty, should that Treaty be ratified, Congressman Frederick

C. Hicks has introduced a bill, H. R. 10647, to authorize the conversion of two battlecruisers into airplane carriers. This highly desirable measure reads, in part, as follows: "The President of the United States is hereby authorized to undertake the conversion of any two thereof (battlecruisers of 1916 program) into airplane carriers within the limits of cost heretofore authorized for said battlecruisers." This permits the saving of two thirty-three-knot ships of about 33,000 tons each displacement, gives us two fast and serviceable carriers, and approximates the recommendation of the General Board for two large size carriers of sufficient speed to enable them to maintain their position in the advance scouting line of the fleet or in any position which strategy and tactics make necessary. And, too, the cost of the battlecruisers, as originally laid down, will equal approximately the estimated cost for the construction of new carriers of equal tonnage and speed—about \$28,000,000 each. So much money already has been spent on these cruisers that the conversion will give us not only two desirable carriers but will save a sum estimated at \$20,000,000. On the other hand, should the bill not become law, and the two cruisers therefore not be converted into carriers, the monetary loss will be the \$30,000,000 already paid out or contracted for under the 1916 program, plus the cost for the two new carriers under the terms of the Five-Power Naval Treaty.

The crux of the whole matter is found in this phase of the Treaty: The United States is permitted to convert these two cruisers, which are of 43,500 tons displacement, into carriers of 33,000 tons displacement; but if this is not done we must content ourselves with new carriers of not more than 27,000 tons displacement. Also the two 33,000-tonners will accommodate eighty airplanes. The 27,000 tonners will not carry more than sixty planes.

Even the novice can see the desirability of this legislation. We save millions; we get two real carriers of size sufficient to make them formidable ships; we get them quickly; the money already has been appropriated under the 1916 program; we show ourselves to be squarely behind the Treaty; and we recognize the importance of aviation with the fleet. Without a preponderance of aviation no fleet can successfully meet an enemy so equipped.—*U. S. Air Service*, March, 1922.

**SHIPPING SUBSIDY PROVISIONS OF NEW MERCHANT MARINE ACT SUMMARIZED.**—President Harding's recommendations concerning the direct and indirect aids to be extended to our merchant marine have been embodied in a bill just introduced into Congress and which has been designated the "Merchant Marine Act, 1922." Section 701-703 of this measure provides for the granting of subsidies in varying amounts to American owners of every sail- or power-driven vessel of more than 1,500 gross tons and operated in the foreign trade, who elect to avail themselves of such compensation. For each 100 nautical miles traveled by such vessel, the subsidies payable are to be calculated on the following speed basis when on light draught:

Speed knots	Subsidy cents per gross ton
Under 13.....	.5
13 and over but under 14.....	.7
14 and over but under 15.....	.8
15 and over but under 16.....	.9
16 and over but under 17.....	1
17 and over but under 18.....	1.2
18 and over but under 19.....	1.4
19 and over but under 20.....	1.6
20 and over but under 21.....	1.8
21 and over but under 22.....	2
22 and over but under 23.....	2.3
23 or over.....	2.6

## VESSELS UNDER 5,000 TONS

Power-driven vessels over 1,500 and less than 5,000 gross tons are to receive compensation as though they were in reality of 5,000 tons. The mileage upon which compensation shall be paid is to be determined, both for sailing and power-driven ships regardless of the vessel's log, according to a table of distances to be approved by the Shipping Board between the ports cleared and entered by such vessels.

Only vessels engaged in direct foreign trade, that is, where one of the ports is a port of the United States or of its possessions, shall be entitled to compensation, but vessels engaged in indirect foreign trades which shall transport passengers or freight to or from a port of the United States at least once a year are to receive compensation for mileage covered in such indirect foreign trade. Furthermore, American vessels operating between foreign ports primarily to gather cargo for delivery to home vessels engaged in the direct foreign trade and actually turning over one-half of the cargo handled by them to American ships in direct trades are likewise to be entitled to a subsidy.

Where a vessel is owned to the extent of a half or more by a single individual or corporation, no subsidy is to be allowed her unless one-third of her cargo-carrying capacity has been opened to engagement by independent shippers. This provision is clearly aimed to prevent vessels owned by great industrial companies, such as the Steel Corporation, from enjoying the benefits of the subsidy when they are engaged in carrying products exclusively for their owners.

## Foreign Ships Barred

In order to guard against vessels under foreign flags being transferred to American registry for the purpose of enjoying the benefits of the proposed subsidy, the new act provides that no foreign built vessels shall be entitled to compensation after the date the act takes effect except in special cases where the Shipping Board passes a resolution permitting such foreign built vessel to receive the payments provided in the contemplated statute.

Another clause provides that no shipowner is to receive a subsidy three years after the passage of the act who is unable to show that seventy-five per cent or more of the total gross tonnage owned directly or indirectly or operated by him, whether as owner, charterer or agent in the foreign trade consists of vessels of American registry. This provision will affect concerns in the position of the International Mercantile Marine Company, the bulk of whose tonnage is under British registry.

Before becoming entitled to a subsidy, the owner of a vessel must enter into a ten-year contract with the government by which he binds himself to have all repairs to his vessels effected in an American port and to carry foreign mails from this country without compensation. If he lacks experience, means, or ability, the Shipping Board may decline to enter into a contract with him.

Should the Shipping Board in the case of an individual service decide that the compensation allowed by the act is insufficient, it may increase the sum awarded the vessel owner until it amounts to double the figures named in the statute. Conversely, if the Board is of the opinion that the amount of compensation awarded is excessive it may reduce the amount prescribed by law.

In another section, the wording of which is not exactly clear, the act provides that whenever an owner shall derive in any fiscal year from the operation of such of his vessels as are in receipt of a subsidy, a net operating income of more than ten per cent per annum, he must turn back

to the government one-half of all his earnings in excess of such ten per cent. According to Chairman Lasker of the Shipping Board, this ten per cent profit limitation clause applies to the owner's investment in each individual ship rather than to his fleet as a whole. The section means further that all earnings above ten per cent are to be split equally between the owner and the government subsidy fund, until the full amount of the subsidy has been repaid, after which the owner may retain all income. —*Nautical Gazette*, 11 March, 1922.

### AERONAUTICS

WHY THE COUNCIL OF AMBASSADORS REFUSED AMERICA'S CLAIM FOR A NEW ZEPPELIN OF 100,000 CUBIC METERS.—Reports that commercial airships built or fabricated in Germany for America will be limited as to size, if permitted at all, which recently reached Washington from Berlin, have been characterized as doubtful by American air officers.

Basing their opinions on the fact that the recently concluded Arms Conference placed no limit on either size or type of aircraft, and on the specific authority of the Council of Ambassadors permitting the construction in Germany of a large commercial airship for the U. S. Navy, these officers point out that the interests of this country could only be obstructed intentionally by either Great Britain or France. The former might attempt to prevent the arrangement owing to national jealousy or for commercial reasons, and France because of a fear of aerial attacks from Germany if her airship industry is permitted to flourish, it was said.

One possible reason for objections on the part of Great Britain, is said to be that if she cannot control the air as well as the sea, she is loth to let America get started in lighter-than-air construction. England has still to hear from her dominions relative to their willingness to aid in the financial support of her contemplated "imperial airship scheme" which would link the mother country to their shores. Their replies are due next month, and it is believed that Australia, New Zealand and South Africa will agree to support the project, although Canada may not on account of the bad weather prevalent off her Atlantic coast.

The recent announcement from London that Great Britain has abandoned her airship project and that the rigid fleet with its accessories will soon be dismantled for want of a bidder is not credited in Washington, for it is pointed out that the final reply of the Dominions is still in abeyance.

The source of this report, which savors of propaganda, may be readily determined by a simple process of elimination, air officers believe. It is certainly not Germany, as that country, being the creator of the rigid airship industry, is anxious to preserve her pioneer position; France, though apprehensive of Germany in the air, could hardly suspect American aggression in the air, while if the United States did secure a couple of German ships, this would hardly keep the German interests active for more than a year or two; then too, they say despatches from Paris indicate that Americans there feel confident that no effort is being made to prevent the building of the American ship; Italy is not anxious about any possible attack from an American air armada; but in England, despite her previous assistance to this government in securing the permission of the Allied Council for the construction of a rigid in Germany, there lies a possible reason, it is said. Great Britain at one time wanted to take over the German airship works and operate them for the Allies, and she still has her lighter-than-air fleet, reports to the contrary notwithstanding. This fleet, though not in commission, is still held pending the decision of the Dominions as to future trans-oceanic airship lines. England, it is pointed out, is jealous of the remarkable growth of the French merchant

air fleet and also looks askance at recent developments which indicate American interest in commercial airship lines.

It is also to be noted that England has an air officer in Germany today. Air Commodore Masterman, R. A. F., who heads the Inter-Allied Aeronautical Commission in Berlin, from where the recent stories of limiting the size of America's Zeppelin and of possible prohibition on construction came.

The history of the German airship case goes back to the treaty of Versailles which provided that all German aircraft be turned over to the Allies. At the time there were fourteen large German rigids in existence. Seven ships were delivered; two each to England, France and Italy and one to Japan, but none to the United States. The remaining seven were in the meantime illegally destroyed in Germany. Following this action, the Allied Reparation Commission directed that Germany replace the destroyed ships by cash payment, or in kind if the Allied or Associated powers so desired. The commercial airships *Nordstern* and *Bodensee* were seized and turned over to France and Italy respectively, leaving five due from Germany. None of the Allies requested further ships, principally because of France's fear that if Germany were permitted to continue airship manufacture it would constitute a menace to her.

The United States was entitled to two airships, and it was her first choice, as France had received the *L-72*, and England the *L-71*, the two best and largest of the original German fleet. Only one ship was asked for by this government, however, when after the destruction of the *Z-R2* Great Britain was asked to assist America in securing a reparation ship of 100,000 cu. m. capacity. It is claimed that the Council, at England's request, ruled that any rigid airship of over 30,000 cu. m. capacity was a military ship and could not therefore be constructed in Germany, although British air experts had previously stated that an airship of less than 100,000 cu. m. was valueless as a commercial carrier. This discrepancy was pointed out to the Council, however, with the result that finally they permitted the United States to have constructed in Germany an airship of 70,000 cu. m. capacity, or about 2,450,000 cu. ft. of the *L-71* type, for commercial purposes. Today three naval air officers are en route to Berlin to supervise the laying out of the plans and the construction of this craft.

There was another difficulty to be surmounted in the securing of a rigid airship for the United States, on which the Secretary of the Navy made the following statement:

"It now appears that the valuation placed on the seven destroyed Zeppelins by a technical commission operating under authority of the Treaty of Versailles, which the United States was not a party to, was placed at so low a figure that a credit which the United States was assigned by the Allies on the reparations account to cover two destroyed ships is insufficient to cover what the Germans claim to be the cost of building one ship of a modern design under present conditions in Germany.

"The Navy Department has taken the position that no payment of money will be made to Germany for the one airship, and that the extremely low valuation placed upon destroyed ships by the Allies in 1919 and the high estimate now given by the German Government for a single replacement ship in 1922 must be reconciled. The State Department is now conducting negotiations with all parties interested in order to make it possible for the German government to proceed with the construction of an airship in accordance with the specifications of the Navy Department which is representing the Army and the Navy in this matter."

In consequence of the above stated concern demonstrated by British representatives in the efforts of this country to secure a large commercial airship, the attitude of the Allied Council, and the "no aerial-limitation"



policy adopted by the Arms Conference, American lighter-than-air experts are at a loss to understand why the subject of limiting the size of American airships, whether built or fabricated in Germany or not, is being agitated now.—*Aviation*, 27 March, 1922.

**HELIUM PLANT CLOSED DOWN.**—According to a special despatch to the *New York World*, the helium plant a few miles from Fort Worth built by the government at a cost of \$7,000,000 to extract helium from the natural gas piped down from the Petrolia fields has been shut down because funds for its operation have been exhausted.—*Aerial Age Weekly*, 27 March, 1922.

**HITCH IN ZEPPELIN DEAL.**—The Navy Department has notified the State Department that it does not wish the German Zeppelin now being constructed for the United States by Germany under the reparations clause of the Versailles treaty unless it comes to America without cost.

The question has arisen as to whether the amount of money allotted for this purpose by the Allies under the reparations agreement to the United States was sufficient to complete the Zeppelin.

At the Army Air Service it was said that if the Navy refused to take the Zeppelin under additional cost that would not preclude the Army from taking her.—*Aerial Age Weekly*, 6 March, 1922.

**A NEW GAS FOR AIRSHIPS.**—Currenium is the name given a new gas for airships, which has been developed by Dr. Edward Curran, head of the research department of the International Transportation and Manufacturing Company, of Los Angeles, which controls the formula and all rights in the product. It is the result of several years' work by Dr. Curran, who is a chemist, and who produced the gas successfully in 1918. The company owning the formula is preparing to engage in the manufacture of the gas by an electrolytic process at a cost, it is estimated, about \$100 per thousand cubic feet less than its costs to produce helium.—*Aerial Age Weekly*, 27 March, 1922.

**THE "R-38" REPORT.**—Two days after the loss of the *Roma*, the report was published of the Accidents Investigation Committee on the loss of the airship R-38 at Hull on August 24 of last year. In general, the committee found that in order to fulfill the requirements laid down for the vessel the designers took risks by not availing themselves of the results of model experiments and by basing their calculations too extensively on the precedents set by earlier British designs of airships. The vessel as constructed failed to fulfil the prescribed requirements, and at the same time was structurally weak so far as manœuvring stresses were concerned. Professor Bairstow, a member of the committee, calculated that the factor of safety under aerodynamic loading conditions that were known to have occurred was not above two, and that under conditions that might easily have arisen it would not have been above one. The design, it would appear, was satisfactory from the point of view of the strength provided to resist the forces and moments arising from the buoyancy and the distribution of the weight; but, from the point of view of manœuvring stresses, it was defective. In this connection it is to be noted that the instability of the vessel was such that large movements of the control organs were necessary in order to hold her on any set course, and that she was fitted with specially powerful control surfaces of a new design. The material of which she was built was in general up to specification, although the committee found one or two weak members which, although they did not contribute to the disaster, were significant as indicating some lack of

supervision during the construction period. The vessel met with disaster when maneuvering at high speed simply and solely because the dynamic stresses added to the static were in excess of what her structure could support. As in the case of the *Roma*, defects of a serious nature developed in the vessel on flights preceding that on which the disaster occurred. On the third trial, for instance, disaster was narrowly averted by the prompt action of the commander in steadying the vessel and relieving the stresses on certain amidship girders which had failed when the speed was increased to 50 knots.—*Engineering*, 3 March, 1922.

THE "ROMA" DISASTER.—The *Roma* disaster, with its lamentable sacrifice of valuable lives, is the last bit of evidence that Congress should need in urging the necessity of appropriating sufficient funds to develop our supply of helium. It may be argued that the use of helium would not have saved the *Roma*, but the crowning horror of the airship's bursting into flames would by its use have been avoided. So much is apparent in advance of inquiry, which must be searching in vital details of construction and operation.

There is no parallel between the accident to the *R-38* and that to the *Roma*, for whereas the *R-38* collapsed on a test flight, the *Roma* had made scores of trips in Italy prior to its being brought to the United States, and on its first long trip from Langley Field to Washington, it made a very creditable showing.

The report of the investigating commission will be awaited with great interest.—*Aerial Age Weekly*, 6 March, 1922.

INFLAMMABILITY OF AIRSHIPS.—The *R-38* and *Roma* disasters, although due to different causes, naturally focus attention on the fire which was the one common element of both. In both cases the ships would have been complete wrecks without the fire, but with the loss of few, if any, lives. In neither case was there any explosion, except of gasoline tanks, but the extremely rapid spread of the flames left little chance for escape.

The most obvious remedy and perhaps the only one for small blimps is, of course, the use of helium gas. For larger ships, of say 1,000,000 cubic feet or more, there is another solution of the problem which seems to hold even better promise than helium. This is to make the envelope itself fireproof, which for all ordinary purposes would make hydrogen as safe as helium. Even a slow burning or so-called "flame-resisting" fabric would be immensely safer than the very inflammable materials used at present. Not only would they be more resistant to external ignition, but a hydrogen fire started would spread much more slowly.

In either case, helium or fireproof envelope, no aircraft will be entirely safe from fire until we have satisfactory heavy oil engines. It looks to us as if all three lines of development should be prosecuted with almost equal vigor, i. e., helium, fireproof envelope, and heavy fuel. Any two of these together should be sufficient to make an airship safe from fire.—*Aviation*, 13 March, 1922.

HELICOPTERS.—Experimental work carried out in France is giving definite results that offer at least some possibility of important developments in the future of aviation. The helicopter has always been regarded as an illusory application which may be perfect in principle but exceedingly difficult of realization, and while more or less successful attempts have been made to raise a machine vertically from the ground, most experimenters have found it difficult to make horizontal flights and to prevent the machine from rotating. M. Pescara, an Italian engineer, has probably done more than anyone else in the way of obtaining practical results.

His helicopter was shown at the last aeronautical exhibition in Paris, and since then he has been developing his ideas with the aid of funds supplied by the French government, which is taking a keen interest in this new phase of aviation, as well as in everything else connected with aerial flight. The Pescara apparatus weighs about 800 kilos. and is fitted with an engine of 180 horsepower, driving a number of horizontal propellers in opposite directions whereby the effects of rotation are eliminated, or at any rate considerably reduced. In preliminary trials carried out during the past month the machine repeatedly left the ground and was maintained for several minutes at a height of three feet or four feet, when the apparatus itself was almost stationary. While the trials are satisfactory so far as they have gone they are yet far from conclusive, but it is obvious that progress has been made with the helicopter, and its future will be looked forward to with interest, not less in this country, where Mr. Louis Brennan's machine is nearing completion, than in other lands.—*Engineering*, 13 March, 1922.

**BRENNAN HELICOPTER LIFTS OFF.**—Louis Brennan's experimental helicopter completed its first actual successful test at the Farnborough air-drome on February 9. Rising vertically from the ground and hovering in mid-air for some minutes, the helicopter landed lightly almost on the identical spot from which it rose.

The machine, weighing more than a ton, carrying a pilot and 250 pounds of excess weight was sent up secretly in a gyroscopic test.—*Aviation*, 27 March, 1922.

**SPEED OF 312 MILES AN HOUR CLAIMED FOR A HELICOPTER.**—An air journey from New York may be made in a single day, according to the remarkable claim made on behalf of Hansch helicopter, news of which has been received by the Air Ministry through unofficial channels.

The machine is the invention of a Dutchman. It is said to be capable of attaining a speed of 312 miles an hour, to be able to ascend and descend vertically or to remain stationary in the air over any given spot without the least danger of failing.

The news is the more interesting since the British Air Ministry intended, subject to Treasury sanction, to offer a prize of £50,000 for a practical design of a helicopter.—*Aerial Age Weekly*, 13 February, 1922.

**ARMORED FIGHTING AIRPLANES.**—In the paper on fighting airplanes read by Major Green before the Royal Aeronautical Society, which is reproduced in parts in this issue, the view is expressed that few fundamental changes will occur in this type of machine in the near future, say, within the next ten years. The lecturer is of the opinion that the principle improvements will consist in better performance and in an increased rate of fire for the guns, and that the specialized types for high altitude and low altitude work which were developed toward the end of the war will remain the main fighting craft of the air.

As Major Green says, it is very unsafe to predict the development of airplanes. However, it seems to us that the lecturer's views on the immediate development of the fighting or pursuit airplane are ultra-conservative, for they do not contemplate the possibility of a change in the strategy and tactics of air fighting.

What indeed is the present situation? Drawing on the naval simile, the pursuit airplane represents the capital ship of the air, if not in punishing power, then at least in its intent and function. That is, the pursuit airplane exists for the purpose of enabling one to establish aerial ascendancy, or mastery of the air, by sweeping the skies clear of enemy

pursuit airplanes and, as a secondary result, of observation and bombing airplanes as well.

Now, the pursuit airplane derives its offensive power from gun power and maneuverability, and not from gun power and protection, as the capitalship. The protection in the case of the pursuit airplane is entirely a function of its maneuverability, for given two airplanes of equal gun power but unequal maneuverability, the advantage will lie with the more maneuverable ship, all other things being equal. But the reason this is so is due to the fact that our capitalships of the air are highly vulnerable to gunfire provided it is possible to hit them. The question then arises whether there should not be developed a type of armored pursuit airplane endowed with a good performance, maneuverability, and range, which will be invulnerable to gunfire, or almost so. If such a ship had a performance and range slightly superior to that of observation and bombardment airplanes, and be just capable of outmaneuvering the latter types, there would become available an airplane which would actually fill the function of a capitalship of the air. Such an armored single seater could tackle any kind of military airplane, for, given equal gun power, the superior performance and maneuverability of the ordinary pursuit machine would be of little avail against the armor-plated "battle-plane," for the latter's superior range would enable it to "keep the air" while the pursuit plane would be forced down by lack of fuel, if for no other reason.

The development of such an armored battle plane is well within the present engineering possibilities. As a type, the cantilever metal monoplane is suggested, for it would permit of working the armor plating into the structure of the machine and so make it contribute to its strength, while on the other hand the cantilever monoplane does away with all those exposed vital parts (struts, wires, etc.) which when damaged may cause the machine to collapse.

We are fully aware that there are some serious objections to the use in warfare of such a machine; we nevertheless believe that the question should be gone into in detail if for no other reason than the possibility of some other air force tackling the question.—*Aviation*, 20 March, 1922.

ORDER FOR DOUGLAS TORPEDO PLANES.—Rear Admiral William A. Moffett, Chief of the Bureau of Naval Aeronautics, has placed with the Davis-Douglas Co. of Los Angeles an order for the construction of eighteen Douglas torpedo planes.

Contrary to a rumor current in the industry, this order was not placed with the Naval Aircraft Factory in Philadelphia, but the latter will build six Douglas bombers, while eighteen additional machines of this type will be constructed on competitive bids.—*Aviation*, 3 March, 1922.

NEW INVENTION IN AERIAL PHOTOGRAPHY.—A recent invention by F. M. Huddleston, Los Angeles, Calif., is creating considerable interest in aero-photographic circles. The Aerograph, as this invention is called, consists of a small pilot balloon from which is suspended a combination gyroscope and gimbal for holding the camera, together with electrical devices for controlling its operation. Absolute control is had from the base, which consists of a truck upon which is installed a winch and hydrogen generator, as well as a control board.—*Aviation*, 13 March, 1922.

NEW 1,000-HORSEPOWER AIRPLANE ENGINE WEIGHS ONLY 2,200 POUNDS.—A new airplane engine which, though weighing only 2,200 pounds, develops 1,000 horsepower, has been constructed by D. Napier and Son, Ltd., of England.

This new engine is to be fitted to a specially designed airplane now being built for the British Air Ministry for coming trials. At the present time there are rumors that Prof. Hugo Junkers, of Germany, is building a huge monoplane which will carry four 1,000-horsepower. Junkers opposed piston-type Diesel oil engines.—*Power*, 7 March, 1922.

**BRITISH SAFETY TANK COMPETITION.**—A number of tanks entered into the safety tank competition organized by the British Air Ministry were recently tested at the Royal Aircraft Factory in Farnborough.

The Air Ministry offered prizes amounting to \$10,000 for a tank which will not burst or leak and will be safe from penetration by bullets. Twenty-seven firms have entered, of which one is Italian, two French, one Japanese, one American and the rest British.

The rules of the competition provide that the tank shall weigh not more than one and three fourths pound per gallon. Among the other qualities insisted upon are lightness, durability, indifference to extremes of temperature and simplicity of construction.

Imitation "crashes" are realistically staged in the tests. Each competing tank, incased in a rough wooden fuselage, is attached to a lump of concrete weighing 600 pounds to represent the engine. The whole contraption is hauled to the top of a large balloon shed, about 100 feet high, then released and allowed to rush on wheels down a rail to smash into a bed of hard slate at the bottom. The tank descends at the rate of about 80 m.p.h. and reaches the bottom with a satisfactory thump.

Three kinds of shock-absorbing tanks have so far been tested. The first, manufactured by Beasley, Sims and Morris, consisted of three shells—an outer one of thin steel with a layer of rubber on the inside, then a steel with another layer of rubber, and, thirdly, the gasoline vessel itself, which is kept in position by shock-absorbing springs.

The second type, the invention of J. Gibson, is made on the bulkhead principle, the tank, shaped like a barrel, being made in three sections, the sections in front and behind the actual gasoline tank arranged to prevent damage to the gasoline tank itself.

The third tank sent in by the French firm of Bramson, is made of a rubber preparation with a sort of armoring of fine woven wire. This tank is mounted on rubber shock-absorbers, so that when it collides it bounces back like a ball.

No result will be reported until the tests are finished. Later the tanks will be fired upon by machine-guns at short range to test their capacity to remain gasoline-tight when penetrated by nickel or incendiary bullets.—*Aviation*, 20 March, 1922.

**FLYING WEATHER FORECAST.**—Arrangements have been made for the inclusion by the Weather Bureau of a *flying weather forecast* for zones 1 to 5, inclusive, for the period midnight to noon of the following day, in the *weather broadcast* from the naval radio station at Arlington, at 10 P. M. daily, commencing January 16, 1922.

The form of this forecast and the areas covered will be the same as that included in the morning *weather broadcast* from Arlington.—*Aerial Age Weekly*, 6 March, 1922.

**SAFE FLYING IN FOG.**—The very latest idea for flying is a wireless compass which can be set to any destination. The pilot will grope his way down to the airdrome by an arrangement of intersecting searchlight beams, the height of the point of intersection of the beams above the airdrome being known by the pilot. This is the idea of Sir Arthur Whitten Brown, navigator to the late Sir John Alcock on his trans-

Atlantic flight, who states that the wireless compass will be worked by directional wireless, the compass tuning in with a ground wireless station. Thus, if a pilot wants to fly from London to Paris, he sets the compass in tune with the Le Bourget (Paris) wireless station, and then he steers by this compass through the fog—or above it when possible—and he will find himself in due course over the Paris terminal.

In practically all fogs the airplane pilot finds clear weather before 1,000 feet up, and experiments have recently been conducted successfully at Croydon with an instrument for ascertaining the height of the fog. This instrument is sent up on a small balloon, and on it is a brass ring. As long as the instrument is in the damp fog the ring is held in position, but as soon as it gets above the fog into clear, dry air, the catch holding contracts and the ring slides down the string. The amount of string paid out is measured, and this gives the height of the fog. It is expected that by next year fog will not in any way interrupt the air liners. —*Aviation*, 13 March, 1922.

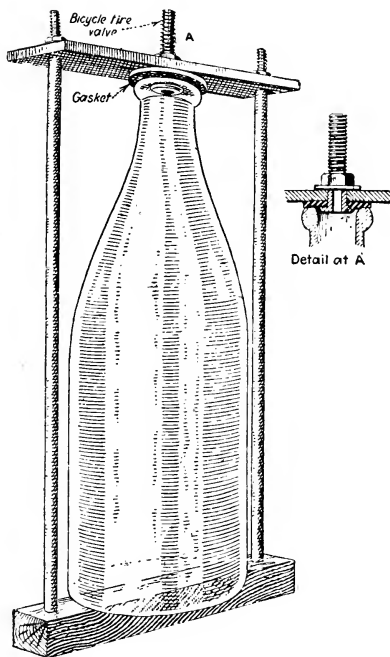
### ENGINEERING

REMOVING BOILER SCALE WITH CO<sub>2</sub>.—After trying to remove the scale accumulation from a battery of boilers by the usual method with little success, the authors decided to experiment with a solution of carbon dioxide in water. The success of the laboratory work and the subsequent tests on factory boilers led to a continuation of the investigation. While the experiments failed to develop a "cure all" for boiler troubles, the results presented in this report seem worthy of note as indicating what may be done in the case of certain troublesome scales. Fortunately it is easy for the engineer to find out whether this treatment will be successful for his particular conditions without going to the expense of making a trial with the actual boilers. The effect of the treatment on a given scale can be determined by the apparatus shown in the figure. This consists of a heavy soda-water bottle equipped with an ordinary bicycle tire valve. The method of clamping indicated insures a tight joint and at the same time permits the valve to be removed in order that scale or water may be placed in the bottle or withdrawn.

In testing, a few fragments of scale were placed in the bottle and covered with water. The bottle was then closed and charged from an ordinary carbonating apparatus such as is used in connection with soda fountains. The pressure regulator was set so as to give a pressure of 70 lb. per sq. in. The action on the scale was observed from time to time, but it was ordinarily several days before marked disintegration of the scale became apparent. Little was gained in any case by continuing the treatment more than a week or ten days.

Further details of the experimental work will be given near the end of the article. For practical power-plant work it is sufficient to know that if the scale shows marked disintegration in the bottle, it may be expected that the gas treatment in the boiler will produce the same result.

After preliminary tests with the bottle experiments were made on two horizontal-return-tubular boilers supplied with feed water containing about 7 grains of total solids per gallon. The chemical composition of the solids were as follows: Silicon dioxide (SiO<sub>2</sub>), 56.1 per cent; ferric oxide and alumina (R<sub>2</sub>O<sub>3</sub>), 0.58 per cent; calcium oxide (CaO), 6.98 per cent; magnesium oxide (MgO), 3.98 per cent. The scale was the results of years of accumulation. It was hard and very adherent, so that the air hammer and other methods of scale removal had little effect on it.



Before trying the carbonated water, an attempt was made to remove the scale by the use of a solution of sal soda and lye. One hundred pounds of sal soda and seventy pounds of lye were put in the boiler. It was then filled with water to the normal level and kept boiling for a week. The removal of a small amount of recently formed scale was accomplished by this treatment, but when it was repeated, some weeks later, no scale was removed.

Before beginning the carbon-dioxide treatment the blowoff pipe from the boiler was connected with the suction of one of the feed-water pumps. This pump then functioned as a circulating pump, withdrawing water from the rear of the boiler and discharging it into the front end. The boiler was cut out of service and allowed to cool with all exits closed. This was done so that it would be filled with boiled water free from dissolved gases. Cooling was facilitated by fitting temporary con-

nections to several of the fire tubes and passing cold water through them.

Two cylinders of carbon dioxide, each containing about 50 lb. net, were emptied into the boiler through the discharge pipe from the circulating pump. The pressure gauge on the boiler then showed 37 lb. The next day another full cylinder of gas was put in, and the gauge showed 45 lb. pressure. The temperature of the water was 84 deg. F.

The boiler was then allowed to stand eight days, by which time the pressure had fallen to 30 lb. It was then opened up, and the softened scale was knocked off with water from a high-pressure hose. The scale raked out of the manhole was found to weigh 287 lb. Almost half the surface of the boiler was free from scale and rust, and the exposed surface had the blue color of new tubes.

After a week's service the boiler was again opened up, but no scale was found to have accumulated on the crown sheet. Similar treatment was given to another boiler of the same battery with practically the same results. About a year later it was found possible to cut the boilers out of service, so the treatment was repeated on both. This time, more than 100 lb. of scale was removed from each boiler, after which they were practically free from scale.

The experiments indicate that carbon dioxide in water is a solvent for certain boiler scales that are high in lime and silica and comparatively low in carbonate. The use of this treatment is advocated only after laboratory tests (by the "soda-water bottle" method) have shown that it is applicable to the case under consideration.

In applying this method, it is important to have all joints and valves absolutely tight to prevent the loss of carbon dioxide. However, small leaks in the main stop valves of the steam lines will do no harm if steam pressure (from other boilers) is on the line. This will prevent any outward leak.—*Power*, 14 March, 1922.

**A NEW DEVELOPMENT IN MARINE PROPULSION.**—The contract which was placed recently with Messrs. Scotts' Shipbuilding and Engineering Company, Limited, Greenock, for the construction of a 400-ft. twin-screw vessel for Messrs. Alfred Holt and Co., of Liverpool, has attracted a considerable amount of attention in engineering and shipowning circles throughout the country on account of the departure made in connection with the propelling machinery for which Scott-Still engines have been adopted. In an association extending back to 1865, the firms of Scotts' and Holt have been responsible for many important advances in naval architecture and marine engineering, and it is fitting that they should be associated now with the latest development in marine propulsion.

The engines for the new vessel will be constructed under licence from the Still Engine Company, Limited, 7, Prince's Street, Westminster. It is gratifying to know that the Still engine is a purely British production in its inception and subsequent development. Scotts' Company directed their attention in 1916 to the slow-running merchant type of marine Still engine, and have designed and constructed an experimental single-cylinder unit of about 400 b.h.p., with which they have been carrying out an extensive series of trials at their works. The first of these trials was made in May, 1920. Following upon the trials made by French engineers, dealt with in our issue of September 2 last, Captain H. Riall Sankey, M.I.Mech.E., in October last conducted a series of trials, and his report, now available, is appended to this description of the machinery installation for the new Holt liner. The improvements introduced from time to time will be incorporated in the engines for the present contract.



The Scott-Still engines for the Holt vessel now ordered will have a combined brake horse-power of 2,500 when running at from 115 r.p.m., under ordinary service conditions. Each set of main engines will have four cylinders, 22 in. diameter, with a stroke of 36 in. The engines will be of enclosed type with forced lubrication to all the principal bearings. A group of pumps will be driven by levers and links from the crankshaft at the forward end of the engines, and will embody those required for the operation of the main engines, with the exception of the valve gear operating pumps, and the scavenging blowers which will be motor driven. All the usual engine-room auxiliaries, and the winches (11 in number) and the windlass will also be motor driven. The steering gear will be of Hele-Shaw Martineau type. Electric power will be supplied at 220 volts by two 160-kw. Diesel-driven generators, running at 250 r.p.m., and one generator of 50-kw. capacity driven by a Diesel or semi-Diesel engine. For starting these engines a compressor set will be provided. It is intended that one large generating set will supply the electric power required at sea and normally in port. When all the winches are in operation, the power will be supplemented by the 50-kw. set. A small lighting set of 12-kw. capacity at 110 volts, with a semi-Diesel engine, will also be provided capable of being started by hand, and a rotary converter will be fitted. A special feature of the installation is the absence of high-pressure air compressors. The thrust blocks will be of the Michell type. The present intention is to carry out a series of test-bed trials of the main engines at the works before fitting them on board the ship.

Some particulars of the characteristics and broad principles which have influenced the design of the Scott-Still engine will be of interest. The engines consist of an ingenious combination of oil engines and steam engines. The main source of power is oil consumed within the cylinder for the down stroke, operating on the two-cycle principle, while steam forms a supplementary source of power, being used upon the up-stroke. The oil fuel is injected into the cylinders without the use of high-pressure air. The engines are designed to reduce heat losses to a practical minimum, the primary consideration being to accomplish this in such a manner as to improve the thermal conditions of the working cylinders and so ensure the maximum efficiency from the fuel burnt therein. The combustion cylinder liners are of special form to secure immunity from heat cracks. On each cylinder top there is only one opening, and no separate cover is required for the combustion cylinder. Forming an integral part of each engine there is fitted a regenerator which is constructed like a small oil-fired water-tube boiler, and supplies steam for starting and manœuvring the engine. When the engine is started, the oil burners are shut off, and the regenerator then serves merely as a steam and water reservoir with which the water in the combustion cylinder jacket is in circuit. The heat from the jacket water, and that recovered from the exhaust gases through the medium of the regenerator and the feed heater incorporated therewith, all goes to form steam which performs useful work on the steam side of the engine pistons. The thermal working conditions of the cylinders result in the compression pressure being considerably less than in the ordinary Diesel type of engine. The valves on the steam side of the cylinders are operated by oil under pressure, which simplifies and facilitates the control of the engine for starting-up and while manœuvring. An impressive feature of the Scott-Still engine is the absence of the complicated array of rods, valves and cams associated with the ordinary Diesel engine. The results obtained from the experimental engine at Scotts' Works show that the Scott-Still engine has an advantage in fuel economy over

the best Diesel engine; but even more important, from the shipowner's point of view, is the fact that the space occupied by such an installation and the weight of machinery in sea-going trim are considerably less than with Diesel engines of the same power. It will be seen that the Scott-Still engines have many novel and attractive features, and the results of the new Holt vessel will be awaited with the greatest interest. —*Engineering*, 10 February, 1922.

**TEST ON STILL STEAM-OIL ENGINE.**—A test recently made on a Still steam-oil engine, conducted by H. R. Sankey as reported in *The Engineer*, is reproduced here. The Still engine used in the test is a one-cylinder unit. The upper end of the cylinder is the oil-burning portion, while the lower end under the piston is the steam cylinder. In the commercial units it is the intention to employ three cylinders arranged with

TABLE I

Dimensions of engine—				
Main cylinder:				
Stroke.....				36 in.
Bore.....				22 in. diam.
Piston rod.....				6¼ in. diam.
Auxiliary high-pressure cylinder:				
Stroke.....				22 in.
Bore.....				14 in. diam.
	Over- load	Full Load	Three Quarter Load	Half Load
Maximum pressures in combustion cylinder, lb. sq. in.....	615	595	600	585
Boiler pressures, lb. abs.....	114	112	111	111
Exhaust of engine (inches mercury).....	26.5	26.9	26.8	25.9
Temperatures (deg. F.) Exhaust gases, boiler inlet.....	756	678	579	494
Feed water.....	78	76	79	78
Exhaust gases to atmosphere.....	156	164	181	181
Steam in boiler.....	347	346	345	345
Weight of steam passing through engine (pounds per hour)...	1,025	892	583	355
M.e.p. referred to combustion cylinder—				
Combustion.....	89.53	81.37	71.27	56.63
Steam, high-pressure.....	5.10	3.86	2.07	1.12
Steam, low-pressure.....	6.46	6.14	4.75	2.72
Total.....	101.1	91.4	78.1	60.5
Revolutions per minute.....	129.3	125.0	111.3	97.4
I.h.p. combustion cylinder.....	400.5	351.5	274.1	190.6
I.h.p., total.....	451.7	394.7	300.3	203.5
Brake load (pounds).....	1,500	1,380	1,125	850
Hp. absorbed brake.....	387.9	345.0	250.4	165.6
Brake efficiency, per cent.....	85.9	87.4	83.4	81.4
Hp. used in scavenging.....	20.7	17.7	13.5	6.5
Effective horsepower.....	367.2	327.3	236.9	159.1
Ratio, effective hp. to total i. hp., per cent.....	81.3	82.9	78.9	78.2
Total oil consumption per hour (pounds).....	147.2	126.7	90.9	61.0
Oil consumption per combustion i. hp. per hour (pounds)...	0.367	0.360	0.332	0.320
Oil consumption per effective hp. per hour (pounds).....	0.401	0.387	0.384	0.383
Thermal efficiency i. hp. per cent.....	38.4	39.2	42.5	44.1
Thermal efficiency effective hp., per cent.....	35.2	36.4	36.7	36.8
B.t.u. per minute per i. hp.....	110.4	108.2	99.8	96.2
B.t.u. per effective b. hp.....	120.6	116.4	115.5	115.2
Lubricating oil per hour, lb.....	0.6	0.6	0.6	0.6
Smoke.....	Slight haze	None	None	None

one cylinder carrying high-pressure steam which exhaust into the other two cylinders. This gives three single-acting oil cylinders, one high-pressure and two low-pressure steam cylinders. In the experimental engine a separate steam engine was connected to the crankshaft to act as the high-pressure steam portion. This engine was jacketed by the exhaust gases from the oil cylinder, but not sufficiently to make it thermally as efficient as is to be expected in the commercial engine. The steam

supply is secured from the oil-engine jacket and exhaust supplemented by a separate boiler.

The essential results of the test are given in Tables I and II, while Table III shows the results to be expected from a three-cylinder engine.

Attention is called to the following facts brought out by the tests:

- a. The remarkable fuel economy and the corresponding high thermal efficiency.
- b. The small change in this economy from half to full load.
- c. The capability of considerable overload at a comparatively small increase in fuel consumption per effective horsepower.
- d. The high brake efficiency for a high-compression oil engine.
- e. The low consumption of lubricating oil.
- f. The low temperature of the exhaust gases on final discharge.
- g. The entire absence of smoke, except a slight haze at overload.

At full load the indicated horsepower developed in the combustion cylinder was 351.5, the oil consumption was 126.7 lb. per hour, and since the lower calorific value of the oil was 18,053 b.t.u. per pound, the thermal efficiency was 39.2 per cent. The thermal efficiencies for the other loads are given in Table II.

These thermal efficiencies have been compared with those of an ideal oil engine working between the same temperature limits as the actual

TABLE II

	Over- load	Full Load	Three- Quarter Load	Half Load
Thermal efficiency of ideal engine .....	50.0	50.8	55.0	51.6
Thermal efficiency of actual engine .....	38.4	39.2	42.5	44.1
Efficiency ratio .....	76.8	77.2	83.3	85.4

engine at the various loads. The temperature limits have been obtained by the use of a temperature-entropy chart, and the thermal efficiencies calculated, taking account of the variation of specific heat.

At overload, 1,025 lb. per hour of steam (saturated) passed through the high-pressure and low-pressure cylinders. In the case of the high-pressure cylinder the indicated horsepower developed was 22.8, corresponding to a feed of 45 lb. per indicated horsepower hour. The admission pressure was 111 lb. abs. per in. and the exhaust 22 lb. absolute, and for these steam conditions the feed of the Rankine engine is 21.5 lb. per indicated horsepower-hour. Hence the efficiency ratio is 47.8 per cent, which is distinctly low for a high-pressure cylinder.

For the low-pressure cylinder the following are the corresponding figures: 1.h.p. developed, 28.9; feed, 35.5 per i.h.p.-hour; Rankine feed, 17.1 lb. per i.h.p.-hour; efficiency ratio, 48 per cent.

Usually, the efficiency ratio of the low-pressure cylinder of a condensing engine does not exceed 40 to 45 per cent, owing mainly to the loss caused by "cutting off the toe of the diagram." The higher value of 48 per cent in this case is due to the heat transmitted from the combustion cylinder.

It cannot be doubted that in the actual marine engine of the type which will be built for commercial use, where the high-pressure cylinder is at the bottom of a combustion cylinder, so that the steam receives heat during admission and expansion, the efficiency ratio of this high-pressure cylinder would be at least 90 per cent. As to the low-pressure cylinder, an efficiency ratio of 90 per cent can be expected if the back pressure be increased to the release pressure by passing its exhaust into

the low-pressure portion of a mixed-pressure turbine provided for driving the scavenge air blower. This turbine should be supplied with a small amount of steam direct from the boiler to make up the power required by the blower and for regulating purposes.

In the experimental engine tested, a certain amount of the exhaust gases was used for jacketing the high-pressure cylinder (auxiliary engine). In the three-cylinder unit this waste of exhaust gases would not occur and a corresponding additional weight of steam would be produced in the boiler.

The mechanical losses of the auxiliary steam engine were included when determining the horsepower absorbed by the brake, but in a three-cylinder unit they would not occur.

TABLE III—ECONOMICAL RESULTS THAT MAY BE EXPECTED IN A THREE-CYLINDER UNIT WHEN THE STEAM IS EXHAUSTED INTO A LOW-PRESSURE TURBINE DRIVING THE AIR SCAVENGE BLOWER

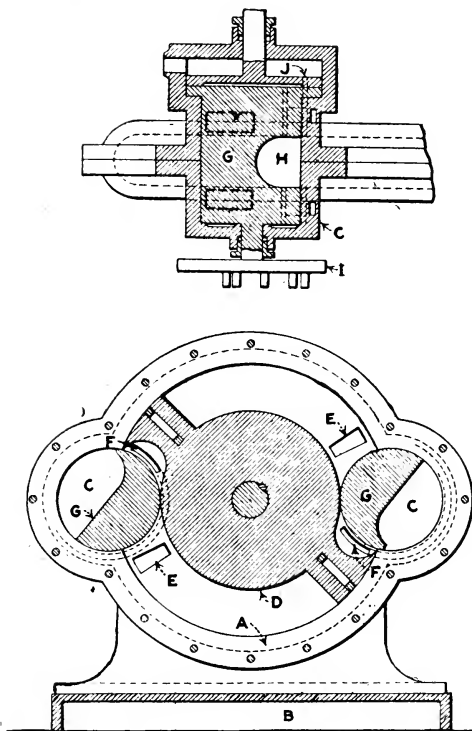
	Over- load	Full Load	Three- Quarter Load	Half Load
Total i. h. p. ....	463	404	302	206
Brake hp. ....	404	359	256	172
Brake efficiency, per cent. ....	87.2	88.8	84.6	83.2
Oil per brake hp. (pounds per hour) ....	0.364	0.353	0.355	0.355
Thermal efficiency per brake hp., per cent. ....	38.7	39.9	39.7	39.7
B.t.u. per minute per brake hp. ....	109.6	106.3	106.8	106.8

The auxiliary engine is single-acting, and judging from general experience, its mechanical efficiency at 40 lb. m.e.p. would be about 90 per cent, which works out to a loss of horsepower equivalent to  $0.0342 \times$  revolutions per minute. Being a single-acting engine, the loss is practically constant at all loads, and this horsepower can therefore be added to the effective horsepower.

The calculations to ascertain what improvement in economy may be expected, based on the foregoing, are given in Table III.—*Power*, 28 March, 1922.

**ROTARY STEAM ENGINE.**—Patents have been issued to Albert C. Johnson, of Stillwater, Minn., covering improvements and modifications in the rotary steam engine. The sketch shows the engine as constructed. The cylinder *A* rests on the engine base *B* and has formed upon its opposite sides extension *C* constituting valve cages. The cylinder has projecting through it the axis or shaft of the rotor *D*, which carries two lugs containing packing rings. The central portion of the rotor is provided with concentric grooves opposite similar grooves in the ends of the cylinder, and these grooves co-operate to form traps for water condensation or oil, which will fill the grooves and serve as a seal for preventing leakage of compressions from the interior of the cylinder to the slight space around the shaft at the end.

Formed in one wall of the cylinder, adjacent to the cage *C*, are exhaust ports *E*, which lead to any suitable pipe or exhaust manifold. Inlet ports *F* are also formed in the walls of the cylinder. Within each of the valve cages *C* is a rotary valve *G*, supported on a stem that passes through one end of the cage. This valve has a portion *H* cut away, which permits of the passage of the rotor piston when in a certain position, and is provided at one end with a flange adapted to cover the adjacent inlet port *F*, and this flange is formed with a cutout portion of less length than the port *F*, but adapted to register at certain intervals. Carried on the stem of this valve is a disc *I*, having pin projections, which engages with an elliptical gear mounted on the end of the rotor.



JOHNSON ROTARY STEAM ENGINE

The number of the pins and teeth in the elliptical gear is such that as the rotor revolves the valve is also constrained to revolve. This admits steam through the port *F* into the cylinder behind the pistons of the rotor, and owing to the eccentricity of the series of pin teeth and the elliptical formation of the gear, it will be seen that the valve *G* will not rotate at a uniform speed, but will rotate very rapidly throughout a portion of a revolution and will have its movement retarded during the remainder of the revolution, this retardation being necessary to permit the passage of piston *D* through the cutout portion of the valve.

Inside each cage, engaging the flange of the valve, is a control disk *J*. This disk has a cut-out portion on its surface adapted to register with the cut-out portion of the steam-valve flange during the rotation of the valve, so as to control the admission of steam into the cylinder through the ports. Each disk carries a stem upon which is secured a crank arm,

and these crank arms are connected by links to a vertical governor shaft.—*Power*, 7 March, 1922.

**PALM OIL DIESEL FUEL.**—Trials conducted by a Belgian firm have shown that a two-cycle engine of the semi-Diesel type, known as the "Drott" and made by a Swedish firm, can be successfully used with palm oil. The "Drott" engine used in the trials was of the stationary type, and was adapted, but not specially designed, for use with palm oil. It was equipped with a storage tank for the oil, so fitted that the cooling water from the cylinder and the hot exhaust gases melted the contents. The tank was divided into three compartments by wire screenings, through which the melted oil filtered before entering the feed pipe. The engine was started from the cold with crude petroleum, and as soon as it was warmed sufficiently the petroleum supply was cut off, and the palm oil introduced through the automatic feed. Water was also injected automatically.—*Engineering*, 10 March, 1922.

**HEAT TREATMENT OF NON-FERROUS ALLOYS.**—Dr. D. Hanson, of the National Physical Laboratory, lectured on the subject of "Heat Treatment of Non-Ferrous Alloys" to the members of the Birmingham Metallurgical Society at the Chamber of Commerce on the sixteenth of last month. The lecture was illustrated with lantern slides, which included excellent microphotographs and was devoted largely to the consideration of the phenomenon of "age hardening" of certain alloys, notably duralumin, and the new "Y" alloy recently discovered and developed at the National Physical Laboratory. Dr. Hanson reminded the audience, however, that "age hardening" was by no means restricted to aluminium alloys, but was found to occur in several directions and had many commercial applications. In the case of duralumin, "age hardening" was found on close scientific investigation, to be due to the difference in solubility of the magnesium silicide compound present in the alloy. The chairman, Mr. A. J. C. Smout, stated that Dr. Hanson had touched upon quite a new field of work, and one which undoubtedly possessed great commercial possibilities if exploited on scientific lines. He referred to several cases where non-ferrous alloys could be heat-treated advantageously.—*Engineering*, 3 March, 1922.

**THEORY OF GREY CAST-IRON.**—Speaking at a meeting of the Institute of Marine Engineers on the subject of grey iron castings, Mr. H. J. Young suggested that grey cast-iron is a very high carbon steel cut up by and surrounding innumerable plates of graphite, that is, a matrix of steel containing many spaces filled with graphite—for this reason can cast-iron be machined, the non-homogeneous material collapsing under the stresses produced by the edge of the cutting tool; for the same reason also has it little or no elongation and many other properties peculiar to itself. A practical object lesson of the truth of these things is obtained from a large propeller casting, blades and boss complete, and weighing, say eleven or more tons. Here the great mass of the boss causes extremely slow cooling of the adjacent parts, the effect getting less and less along the blades away from the boss and also the section of the blades themselves gets less. In practice, the molten metal flowing to the tips of the blades is almost chilled and, therefore, the tips are very hard and brittle and contain but little free carbon. A short distance from the tip this cooling is less severe and more carbon is released, with the consequence that the metal is grey but rather hard. Half-way up the blade the section is greater and the heat given off by the cooling of the boss delays the cooling, hence the metal will be very normal and perfectly grey and machinable. At the root of the blade, where it joins the boss, the cooling

will be extremely slow. The iron has time to free itself almost entirely from combined carbon, and when cold is found to be full of large graphite.—*Engineering*, 10 March, 1922.

**"VIBRAC" STEEL.**—The announcement is made that Messrs. Sir W. G. Armstrong, Whitworth and Co., Limited, following upon researches carried out at their Openshaw Works, Manchester, by Mr. H. H. Ashdown and other experimentalists, have discovered a new steel, styled "Vibrac" steel, which, it is claimed, gets over the temper-brittleness of nickel-chromium steels, a difficulty which has formed the subject of recent papers presented to the Iron and Steel Institute. In great masses it is said to be consistent throughout; it is also highly resistant to torsion and shock, qualities which render it very valuable for turbine motors and shafts, crankshafts, and all machinery component parts which are stressed to a high degree when running at high speeds.—*Engineering*, 24 February, 1922.

### NAVIGATION AND RADIO

**AIR NAVIGATION.**—The most difficult of all problems in connection with "Navigation" is the provision of means in foggy or misty weather to enable an aircraft to locate the aerodrome for which it is bound and to make a successful landing to it. Professor Lindemann has suggested that the best means of landing in a fog might well prove to be the provision by the aerodrome so affected of two pairs of small kite balloons floating above the cloud layer, the first pair being at such an altitude as would enable a gliding machine, which passed between them, also to glide between the second, and lower pair, and after an equal interval of time to land on the aerodrome. In the case of thin fogs or ordinary mists it may be that the specially bright red ground flares which are now being tried will suffice. In heavy fogs there is always the possibility, given the right ground organization, of detecting the position of an aeroplane by sound and of signalling to it by wireless when to glide down and in what direction. This has been done successfully at Croydon.

Suggestions have been made to get rid of the fog either by mechanical means, such as pumping, or, alternatively, by electrical discharges, or even by burning vast quantities of coal or other fuel in order to warm the air above the saturation point; these three methods could easily be tried on a small scale, and would doubtlessly work; when, however, they are figured out for an aerodrome of normal size the cost of their introduction is found to be prohibitive.

It is a natural speculation as to what is likely to be the amount of deviation error in the magnetic compass when machines are built entirely of steel. Such tests as have already been made are, however, reassuring in this respect. It seems that the deviation error in any machine is largely dependent on the proximity of the engine, and that this effect predominates whether the framework is constructed of wood or of steel.

As regards navigation, either when flying over the sea out of sight of land, or when flying at any time above clouds, the necessary instruments to enable the position to be determined by the methods of nautical astronomy are now available. They have become sufficiently developed to enable the position to be obtained with a probable error of not over 10 miles. This is as high a standard of accuracy as is necessary for ordinary air work; it enables a check to be made on the dead reckoning course, and upon any determinations of position derived from wireless methods.

The study of directional wireless is being steadily pressed forward. A particularly promising form of it is the rotating wireless beacon; this method offers the very considerable bait of freedom from the troublesome quadrantal error, but it, like other wireless methods, depends for its ulti-

mate accuracy on a careful study of the conditions which determine the nature of the path followed by the waves.—*The Engineer*, 10 February, 1922.

**BEST COLOR-BLINDNESS TEST FOR NAVIGATORS.**—In a just published report, Dr. F. W. Edridge-Green, special examiner and adviser to the Board of Trade on Color-Vision and Eyesight, says that there is no universally recognized standard of rejection for color-blindness since the wool test has become obsolete. The wool test allows fifty per cent of dangerously color-blind to pass and of those rejected fifty per cent are not dangerously color-blind.

The nautical advisers of the Board of Trade are agreed that anyone who can distinguish between the red, green, and white lights at a distance of a mile has sufficiently good color perception for the purpose of navigation at sea. About twenty-five per cent of the men have diminished color perception and about five per cent will fail to distinguish between the red, green, and white lights of a properly constructed lantern or the actual lights themselves at a distance of a mile. These men may be ranged in three definite classes, the dichromic, who see only two colors in the spectrum, red and violet with a neutral division between them; the trichromic who sees only three colors in the spectrum, red, green, and violet, and who designate the yellow of the spectrum as red-green; and those who have shortening of the red end of the spectrum.

A person of very acute color-vision can distinguish seven colors in the solar spectrum, red, orange, yellow, green, blue, indigo, and violet. Those who have for all practical purposes normal color-vision, six, five or four colors, those who see six failing to distinguish indigo, those who see five, orange as well, and those who see four, blue in addition. Those who can distinguish seven colors are called heptachromic and those of less acute perception, in descending order, hexa-, penta-, tetra-, tri, and dichromic.

The tetrachromic, or those who see four colors in the spectrum, red, yellow, green, and violet, though in continual difficulty about blue and green, have a definite yellow sensation and repeated and extended examinations with actual lights extending in some cases over five hours have demonstrated that for practical purposes the tetrachromic are not dangerous. The possession of a definite yellow sensation is therefore the deciding point for passing as practically normal. The lantern is an efficient test, and enables cases of acquired color-blindness, as for instance those with central color scotoma, to be excluded as well as those due to defective light perception such as shortening of the red end of the spectrum.—*Nautical Gazette*, 18 March, 1922.

**EMERGENCY SEAPLANE RADIO TRANSMITTER.**—One of the greatest dangers to seaplanes flying over the ocean has been greatly lessened by recent radio developments by the Navy; namely, the emergency transmitting equipment now carried on multi-motored machines which permits the sending of radio messages when a plane has been forced to land on the water.

The recent forced landing of a seaplane off the Florida coast will serve well to illustrate the value of this development. Had a navy *F-5L* seaplane had such an accident, she could have sent a radio message immediately and assistance rushed to the plane. The plane could have been found more easily by the rescue vessel not only because her position was known, but also because the kite which is part of the equipment would be visible at greater distances than the plane on the water.

Formerly a plane could use its radio only while in the air where the antenna consisted of 200 or 300 feet of wire trailing behind the plane.



Of course, when the plane landed this antenna could no longer be used. A second antenna, however, was available on some planes, permanently rigged on the upper wing, but only very short ranges could be obtained on this "skid-fin antenna," about ten or fifteen miles. With the new apparatus the ranges obtainable on the water are in general twenty-five per cent greater than those in the air.

The equipment for this transmission is very simple, weighing only a few pounds. There are two kites, one for stronger and one for light breezes, and a reel of specially light antenna wire. When necessary to send a message from the water the radio generator is put in the wind stream of the good motor, if it were not there already, and the antenna wire flown from the appropriate kite. A canvas screen rigged in the wind stream concentrates its force on the wind-driven generator fan, so that, with the motor running slowly, the radio generator will develop full power for sending messages. This work has been done through the Bureau of Engineering by the Anacostia Air Station Radio laboratory. Commander Taylor and Lieut. C. D. Palmer have done most of the field and design work in this connection.

While the outfit was developed for multimotored seaplanes, its field of usefulness is much wider. To mention two other uses: A disabled plane, either sea or land plane, can increase its chances of being found by rescue planes by flying the kite, and with a small expeditionary force a plane so equipped might well be used for all communication.—*Aviation*, 27 March, 1922.

**JAPANESE HIGH POWER STATION.**—The January issue of the *Radio Review* contains some notes on the high-power radio station at Qwaki, near Tokyo, which was opened in March, 1921. The transmitting and receiving houses are about twenty miles apart, and the former contains arc and high-frequency alternator apparatus of 400 kilowatts capacity. The aerial, which is of the umbrella type, is supported by one main tower 656 feet high, which is a self-supporting reinforced concrete structure weighing about 11,000 tons. This tower is surrounded by eighteen masts 197 feet high, which are arranged in a circle round the central tower. The station is employed for duplex transmission, with the Hawaiian stations of the Radio Corporation of America, but it is intended to utilize it later for direct European traffic.—*Engineering*, 3 February, 1922.

**RADIO SETS STANDARDIZED.**—In standardizing specifications for radio apparatus in co-operation with the manufacturers the Bureau of Engineering, Navy Department, has effected a reduction in the price of various items used in radio sets at the present time. Aircraft and medium-range receiving sets, for instance, are reduced in price approximately sixty per cent, as are amplifiers, such as those used in receiving the large selection of lectures and concerns now broadcasted from many parts of the country. Detectors used in such receiving sets are now reduced some seventy-five per cent in price. Medium-size transmitting sets, both of the spark and arc type, are down on the average of thirty per cent, while various types of insulators in common use and necessary in assembling a radio set are reduced on the average twenty per cent.

Vacuum tubes for both transmitting and receiving sets, the latest thing in radio in common use, are down in price on the average about forty per cent. All this material is also improved in efficiency as well as reduced in price, the latest vacuum tubes, for instance, having over 1,000 per cent longer life than the early tubes possessed.—*Army and Navy Register*, 1 April, 1922.

**WIRELESS TELEPHONE DEVELOPMENTS.**—If statistics published in America this week can be accepted as an accurate representation of the position, there has been an extraordinary development of wireless telephony. It is said that the number of receiving sets in use increased in one year from 50,000 to 600,000. The usual plan is to install a small roof radial communicating with a simple receiving set, and plans are taking shape for the division of the country into definite areas for the distribution of wireless communication in the form of concerts, lectures and other public functions. The thing is becoming a craze with the American citizen, and, as might have been expected, it is being encouraged by a press which has an uncanny knack of gauging the selling value of news features.—*The Engineer*, 3 March, 1922.

**SIMULTANEOUS TRANSMISSION.**—Wireless Telephone and Telegraph Messages may now be transmitted simultaneously on the same wave length from a single transmitting set and antenna. This was demonstrated at the Engineering Societies Building, New York, by Dr. Frank B. Jewett, head of the Bell System Research Laboratories. The new achievement is made possible through an electrical "filter" invented by Dr. G. A. Campbell, which allows the separation of the "various frequencies at which individual telephone and telegraph messages are carried." In the demonstration, two such messages, dispatched at the same time, were received and were then detected by a single vacuum tube circuit. The detected current was then passed through the "filter" which distinguishes the telephone frequencies from those of the telegraph. According to its inventor, the filter differs from ordinary tuned circuits in that it separates not only single frequencies but bands of frequencies of pre-determined width.—*Tech Engineering News*, March, 1922.

**RADIO INCIDENTS.**—While the radio exhibition was in progress last week some remarkable demonstrations of "wireless" took place, although none of them figured in the official program. From his desk, General Manager Rossbottom of the United States Lines talked, through an ordinary telephone, with the master of the steamship *America*, over a hundred miles from port. The tragic side of wireless communication was represented by the story told by Captain Jorgenson of the Baltic American liner *Esthonia* which arrived in New York after passing through a succession of terrific storms on the mid-Atlantic. He described how the radio operator on the Norwegian steamer *Grantoft*, after sending out the calls for help, jested with his fellow operators while the vessel was sinking 700 miles off Cape Race, the final message indicating his approaching death and that of all on board. An element of comedy was provided by the announcement that a new feature of the reconditioned *Leviathan* will be a radio telephone equipment in each of the seven hundred first-class staterooms, thus destroying the last hopes of people who have hitherto sought rest and retirement by going to sea.—*Nautical Gazette*, 18 March, 1922.

## ORDNANCE

**A NEW FRENCH GUN.**—During the month much interest was evinced in a new gun which is the invention of a French officer, Lieutenant Delamare-Maze. Experiments with the weapon have been in progress for some time, principally in Belgium, and next week some official trials of it are to be carried out at Liège under the auspices of the Belgian Government, which holds the Belgian license for the patent. Details of the invention, which, it is claimed, can be applied equally well to field and machine guns, as well as to rifles, have not at present been divulged; but it is claimed that as a result of its application the recoil is eliminated

and the speed of the projectile practically doubled. In past trials with a French "soixante quinze" it is stated that a muzzle velocity of 850 m.—say, 2789 feet—per second was obtained, the ordinary velocity being about 1740 feet per second. It is hoped, as a result of improvements since made, that a muzzle velocity of something approaching 3300 feet per second will be reached. The inventor asserts that with the recoil done away with it will be possible to build guns as powerful as those at present in existence at only a third of their weight.—*The Engineer*, 3 February, 1922.

**AIRPLANE CANNON TESTS.**—Recent tests indicate that the 3-inch or possibly the 5-inch cannon can be mounted on airplanes. At present the greatest difficulty seems to be in eliminating the destructive tendencies of the air blast from the cannon. A 2.95-inch cannon is now under test in a Martin Bomber. This is a modified mountain cannon and is mounted to fire downward from the airplane. A 3-inch non-recoil cannon has recently been mounted on the nose of an NSB-1 bomber and promises such success that plans for testing a 5-inch gun are under way.—*U. S. Air Service*, March, 1922.

**NEW TEST OF THOMPSON SUBMACHINE GUN.**—Another successful test of the Thompson submachine gun was completed recently, that conducted at the U. S. Bureau of Standards on March 20 and 21, under the supervision of the Aircraft Armament Board, the head of which is Major W. A. Borden, Army Ordnance Department. One of the officers present in an official capacity was Major M. F. Harmon, of the Army Air Service, with Mr. D. B. Gish, representing the Auto-Ordnance Corporation. The report was made by Major Borden. The latest test started by mounting the gun in the altitude chamber on an improvised mount at 8:30 A. M. on the twentieth instant. The temperature in the chamber was then reduced, and at 11 A. M. it was reported that the temperature had dropped to minus thirty degrees centigrade. At 1:56 P. M. the temperature was minus forty degrees centigrade. One burst of approximately five rounds was fired. At this point the wire connecting the trigger to the outside of the chamber broke. The chamber had to be entered, and it was found that the gun had jammed. Apparently the bolt in going forward had not shoved the round all the way home and had ridden up over the round. The jam was cleared by pulling the bolt back. Six bursts were then fired of approximately ten rounds each. Further firing was stopped at 2:03 P. M. The gun was left in the chamber at the reduced temperature, and at 3 P. M., with the temperature at minus thirty degrees centigrade, two bursts were fired, which completed the first 100 rounds. All firing was satisfactory with the exception of the one jam which occurred at the end of the first burst. The gun was reloaded and left in the chamber all night.

On March 21 at 11:30 A. M. the gun was again fired. During this firing the temperature was minus fifteen degrees centigrade, and the pressure inside the chamber was reduced to simulate an altitude of 24,500 feet. One burst of about ten rounds was fired, when a stoppage occurred. Investigation showed that the primer had misfired. The primer had been struck squarely and properly. The gun was reloaded by pulling the bolt back, and the second burst was fired, temperature minus thirteen degrees centigrade, altitude 24,500 feet. This burst was continued until all rounds were fired. This completed the firing of the second 100 rounds. Major Borden in his report of the test says: "The functioning of the gun was entirely satisfactory with the exception of the one jam reported in the first burst, fired March 20."—*Army and Navy Register*, 1 April, 1922.

## MISCELLANEOUS

**OIL IN GREAT BRITAIN.**—The search for home oil fuel resources is not meeting with success. It was stated by the Secretary for Mines, in reply to a question in Parliament, that the only producing oil well at the present time is that at Hardstoft, in Derbyshire, from which the production for the six months ended December 31 last was no more than seventy-eight tons. The evidence so far obtained has not been sufficiently conclusive to enable the Minister to express an opinion as to the commercial possibilities of oil boring in Great Britain. It is, however, fairly clear that the hopes entertained at an earlier date that a successful industry might be established have been practically abandoned, and it is definitely announced that the government has no intention of introducing legislation to give the Crown any further rights or powers in respect of petroleum than it already possesses. An intimation has also been given that in exercising its powers under the Petroleum Production Act, the government will not interfere with the rights of private individuals further than may be necessary to prevent indiscriminate boring operations.—*The Engineer*, 10 March, 1922.

**WAR OUTRAGE RECALLED.**—An echo of the naval war comes from The Hague, where the International Commission of Inquiry into the loss of the Dutch steamship *Tubantia* has just announced its finding in the Permanent Arbitration Court. The *Tubantia*, it will be recalled, was a big ocean liner owned by the Royal Holland Lloyd. On March 16, 1916, while on a voyage from Amsterdam to Buenos Ayres, she was sunk by an explosion obviously caused by a torpedo. The only mystery about the business was whence the torpedo came. According to the British government, it was fired from a German submarine, but this was flatly denied by the Germans, who on their part declared the outrage to have been the work of a British submarine. This impudent falsehood was soon refuted, for not only was no British submarine anywhere near the scene at the time, but pieces of metal recovered from the wreckage of the *Tubantia* were identified as parts of a German torpedo.

In view of this damning evidence it is not surprising that the International Commission should have declared the *Tubantia* to have been destroyed by torpedo attack from a German submarine. Probably because the commission is composed of jurists belonging to states that were neutral in the war, it has qualified its verdict by stating that the question as to whether the vessel was sunk wilfully or as the result of a mistake by the German submarine commander must remain in dispute. On the other hand, it does emphatically reject the ingenious theory put forward from Berlin that the explosion may have resulted from the *Tubantia* having collided with a floating torpedo. That fairy tale was doubtless invented on the spur of the moment when the fragments of the torpedo were discovered to be of German origin. The world at large, remembering the hundreds of other neutral ships that were torpedoed by German submarines, will draw its own conclusions in this particular case, and doubtless number the *Tubantia* among the innumerable other vessels that were sunk at sight by the U-boat pirates.—*Naval and Military Record*, 8 March, 1922.

**BREAKING STRENGTH OF MANILA.**—From a series of 368 tests of Manila rope in sizes from one-half inch to four and one-half inches diameter carried out at the United States Bureau of Standards during the past three or four years it has been found that the average breaking strength of the rope is very closely represented by the formula  $L = 5,000 d (d + 1)$ .—*The Engineer*, 10 February, 1922.

**PORTUGAL'S STEPS TO SECURE NATIONAL MERCHANT FLEET.**—The Portuguese government decree of November 22, 1921, which came into operation on January 1 last, has been a source of continual friction and disturbance ever since that date. The decree imposes enormously increased port dues and charges which might have been borne philosophically by the shipping community were it not that discrimination of a most unfair nature has been exercised against foreign and in favor of Portuguese vessels. The genesis of the enactment may be traced to the Portuguese ambition to establish a national merchant navy.

Although a qualified official denial has been issued of what is current knowledge abroad, there appears to be little doubt that the forty ex-German steamers which the Portuguese government seized and registered in its own name on joining the Allies in the Great War are to form the nucleus of the new Portuguese merchant marine. It is freely rumored that a Portuguese company, furnished with German money, is to be established for the purpose of taking over these ships, and the scheme is inevitably linked with the name of Herr Hugo Stinnes. Be that as it may, it is significant of the trend of events that a direct line of steamers between Portugal and Germany, with an intermediate call at London, has already been inaugurated by a German company; and obviously, behind all these restrictive dues and port charges with their discrimination against foreign shipping, there is an idea that by such means Portugal hopes to regain to some degree at least, her old-time maritime pre-eminence.

The dues to be paid by foreign ship-owners have not only been increased four-fold, but they are first levied in Portuguese currency and then converted into sterling at pre-war or practically par rate of exchange. This sterling is next converted back to Portuguese currency at the present depreciated rate of exchange in which foreign shipping companies have to pay. The effect is, of course, that all shipping other than Portuguese pays over forty times as much as vessels flying the Portuguese flag. It may be argued that ship owners can recover from shippers and merchants the extra cost in port dues and charges, which amounts to 4s. or 5s. per ton, but when they attempt to do so they are immediately reminded by the merchants that such charges are not payable when the goods arrive in Portuguese bottoms and hence the money-saving tendency is to favor the shipment of cargo on national rather than on foreign ships.—*Nautical Gazette*, 11 March, 1920.

**RUSSIA'S MERCHANT FLEET.**—The Soviet government has recently published figures showing the size of the Russian merchant fleet on November 1 last and in 1913. Details are shown in the following table:

Sea	Steamers		Other vessels	
	1921	1913	1921	1913
Baltic .....	38	197	1	807
White Sea.....	21	48	350	485
Caspian Sea.....	165	259	185	545
Black Sea and Sea of Azov.....	49	379	254	750

Most of the ships belonging to the Russian volunteer fleet and to the Russian Navigation and Commerce Company are in foreign waters outside of the jurisdiction of the Soviet government. Steamers plying on rivers are only fifty-three per cent of their pre-war strength.—*Nautical Gazette*, 4 March, 1922.

**SHANGHAI PORT IMPROVEMENTS.**—Expenditure of \$14,000,000 by China at the instance of five great governments to make Shanghai the greatest port in the world, is fore-shadowed in a report drawn up by an international commission appointed by the governments of the United States.

England, Japan, France, and Holland. General William Murray Black was the American member of the commission. They surveyed the entire port at Shanghai as a consultation board for the Chinese Republic.

That port is destined to be the greatest in the world, for nowhere else is there a seaport with a mighty river navigable for more than a thousand miles by vessels of 10,000 tons and under. Prominent in the project is the channeling of the famous bar at Woosung so that vessels of twenty-eight foot draft may pass up the Shanghai River. Levee work, riprap, and dredging are also provided for.—*Nautical Gazette*, 4 March, 1922.

#### CURRENT NAVAL AND PROFESSIONAL PAPERS

Washington and After—By Admiral Wester-Weymess, *Nineteenth Century*, March, 1922.

Civilized Warfare and Civil Engineers—*Nineteenth Century*, March, 1922.

Future Development of the Fighting Airplane—*Aviation*, 20 March, 1922.

Research With Full-Sized Airplanes—*The Tech Engineering News*, March, 1922.

The Past Year in Naval Aviation—*Aviation*, 20 March, 1922.

The Tactical Relations Between Different Classes of Men-of-War and Their Embodiment in Design (Abstract)—*The Shipbuilder*, March, 1922.

The Present Development of Reinforced Concrete Shipbuilding—*The Shipbuilder*, March, 1922.

The Still Engine for Marine Propulsion—*Engineering*, 3 March and 10 March, 1922.

Electric Propulsion of Ships—*The Shipbuilder*, March, 1922.

Will the Direct-Current Era Return?—*Scientific American*, April, 1922.

At the Sending End of Radio—*Scientific American*, April, 1922.

The First, and Last, 18-Inch Naval Gun—*Scientific American*, April, 1922.

American Warship Practice—*Engineering*, 17 March, 1922.

## NOTES ON INTERNATIONAL AFFAIRS

FROM MARCH 5 TO APRIL 5

PREPARED BY

ALLEN WESTCOTT, Professor, U. S. Naval Academy

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### PACIFIC TREATIES RATIFIED

SENATE RATIFIES FOUR-POWER TREATY.—After extended debate the Four-Power Treaty regarding insular possessions in the Pacific was ratified by the U. S. Senate on March 27 by a vote of sixty-seven to twenty-seven, twelve Democrats and fifty-five Republicans supporting ratification. The treaty extends for ten years, and indefinitely thereafter unless terminated by any power upon twelve months' notice; it pledges the participating nations to a joint conference in case of difficulties arising among themselves, and to consultation as to proper measures in the event of aggression by another nation. Thirty-one amendments and reservations were rejected. Only one reservation was adopted, that proposed by Senator Brandegee reading as follows:

The United States understands that under the statement in the preamble or under the terms of this treaty there is no commitment to armed force, no alliance, no obligation to join in any defense.

After ratification, the question was raised whether the supplementary agreement excluding the Japanese homeland should not have been ratified as a part of the original treaty. This difficulty was avoided by recalling the original treaty and ratifying both together. At this time the following reservation proposed by Senator Lodge was added to the resolution of ratification:

Subject to the following reservation and understanding which is hereby made a part of and condition of this resolution of ratification, and which repeats the declaration of intent and understanding made by the representatives of the powers signatories of the Four-Power Treaty relating to their insular possessions and insular dominions in the Pacific Ocean:

1. That the Four-Power Treaty relating to Pacific possessions shall apply to the mandated islands in the Pacific Ocean; provided, however, that the making of this treaty shall not be deemed to be an assent on the part of the United States of America to the mandates and shall not preclude agreements between the United States of America and the mandatory powers respectively in relation to the mandated islands.

2. That the controversies to which the second paragraph of Article 1 of the Four-Power Treaty relating to Pacific possessions refers shall not be taken to embrace questions which according to principles of international law lie exclusively within the domestic jurisdiction of the respective powers.

ALLEGED AGREEMENT WITH ENGLAND.—During the discussion of the Four-Power Treaty Senator Borah raised the question whether there was not a secret unwritten understanding between the United States and Great Britain for mutual support in the Far East. He based his statement on a stenographic copy of remarks made by the New York lawyer, Paul D. Cravath, as follows:

Mr. Cravath—Now, to my mind a very important part of the achievement of the Washington conference is not recorded at all in black and white in that treaty, or in any of the other treaties that were negotiated, and that is the bringing about of what seems to be a sympathetic understanding between the United States and Great Britain regarding the Far East and Pacific questions generally. I quite agree that under the program produced by those treaties we have practically surrendered our naval position in the Pacific.

I assume that without further fortifications in the Pacific and that with the fleets and fortifications as agreed upon, we could not successfully compete with Japan in the Pacific alone, and certainly we could not compete with an Anglo-Japanese fleet in that region. On the other hand, and to my mind this is the much more encouraging statement based on the same facts, an Anglo-American fleet in the Pacific would dominate Japan, and it seems to me that we have substituted in place of the necessity for creating the greatest fleet the world has ever seen, with all the expense and temptation that involves, an understanding and basis for co-operation with Great Britain which gives these two powers the control of a combined fleet in the Pacific which will be large enough to dominate Japan and make her live up to the obligations she has assumed.

Mr. Davis—I want to know if you are making that statement as a fact, or is it just your own opinion of what would happen?

Mr. Cravath—I have been told by every member of the American delegation. I know definitely that the view is held by Mr. Balfour and I think by every other member of the British delegation, that the result of the conference has been not a formal agreement by any means, but an understanding, and such a degree of understanding and such a basis of sympathy has been created between Great Britain and the United States that both sides assume that in all future emergencies they can both count on having the very closest co-operation.

Mr. Davis—No, that isn't what I mean. What I mean is as to the agreements on fortifications and the Administration's naval ratio. Do you mean to say that both fleets would dominate the Japanese fleet?

Mr. Cravath—Of course, I have no independent knowledge of that. I am not a naval expert, and have no independent opinion on that point, but I am informed that our technical advisers are satisfied that if the United States and Great Britain are on one side, and Japan on the other, the Anglo-American fleet and the entire Anglo-American naval position would dominate that of Japan in Japanese waters.

As I say, I have no independent opinion of my own on that. I am simply repeating what I have been told in Washington.

But, in all events, we are mutually better off, if I am right in assuming that underlying sympathy with Great Britain, than we would have been with as large a fleet as the one we have had in contemplation and on our building program, being opposed with the largest fleet that Japan would find herself physically able to build, and Great Britain being bound, as a matter of course, to keep pace with both. So, assuming that our theory of Anglo-American co-operation is well grounded, it does seem to me that our naval position, as against Japan, has been improved rather than weakened, and we have the great advantage in the reduction of our naval program and all that that means financially and otherwise.



Mr. Cravath afterward issued a denial that he had cited the authority of the American delegates; and the American delegates and President Harding declared that no such understanding existed, and that it would be "perfidious" in view of the open agreements of the treaty.

**OTHER TREATIES RATIFIED.**—On March 29 the treaties for the limitation of naval armaments and regulation of the use of submarines and noxious gases in warfare were ratified by the Senate without reservation, the first by a vote of seventy-four to one and the second unanimously. Senator France of Maryland was the sole opponent of the naval treaty.

The two treaties relating to China were ratified on March 29. The treaty stating international policies regarding China was accepted unanimously, and the one providing for revision of Chinese customs received only one adverse vote, Senator King of Utah expressing the belief that it was unacceptable to the Chinese. Senator Underwood, defending these treaties, agreed there was no obligation to use force in case any party to the treaty should violate its obligations; but he insisted that the moral pressure of the other signatories upon the offending nation would carry great weight.

**FRANCE MAY MODIFY TREATIES.**—*Paris, March 27*—The treaty reservation habit is spreading. At the time they ratified the Treaty of Versailles the French did not know the game. It is different now.

Premier Poincaré intends, when he submits the Pacific treaty to the French Parliament, to accompany it with a reservation analogous to that adopted by the United States Senate. He regards it as fair that one party to a treaty should not assume obligations, implied or otherwise, which another signatory does not assume.

As for the naval treaty, the French executive will present it as signed. But members of the Chamber of Deputies will propose changes. I am informed that the following reservations or amendments may be offered:

First, an amendment changing the French capital ship ratio from 1.75 to 2.5.

Second, a reservation declaring that France deems that the treaty does not bar her from protecting her independence on land or sea.

Third, a reservation stating either that France retains the full right to decide what is a merchant ship, which under the Root plan must not be attacked by a submarine, or stating that France does not regard any vessel carrying guns as immune as a merchant ship.

The last named reservation, which will come from the Chamber's Naval Affairs Committee, has excellent prospects of being adopted. As for the other two, recognized as being basic in character because they mean changing the treaty terms, it is difficult to say at this time what support they will receive.—*New York Times*, 28 March, 1922.

## GERMAN REPARATION PAYMENTS

**REPARATIONS COMMISSION FIXES TERMS.**—On March 22 the Allied Commission on Reparations, meeting in Paris, published its final proposals as to the amount to be paid by Germany during the year 1922, and the conditions to be fulfilled in view of the modified demands. The amount to be paid was fixed at \$720,000,000 gold marks cash (of

which 280,000,000 have already been paid) and 1,450,000,000 marks gold value in materials. The German government was given until May 31 to accept the Allied demands, with warning that failure to do so would involve the penalties provided in the Versailles Treaty.

The more important additional demands were as follows: (1) Measures to prevent exportation of capital from Germany and to secure return of capital already sent out; (2) full independence of the Reichsbank; (3) imposition before April 30 of all the new taxes and reforms proposed by Germany last January, and further taxation to yield an additional revenue of 60,000,000,000 paper marks; (4) an internal loan in some other form than treasury bonds, to meet the present budget deficit. The question of a foreign loan was left to be dealt with later.

GERMANY DECLARES DEMANDS IMPOSSIBLE.—Speaking in the Reichstag on March 28, Chancellor Wirth declared that the German government would be unable to accept the demands of the Reparations Commission. He called attention in particular to the fact that the fall of German exchange as a result of the demands had at once added 28,000,000,000 marks to the German budget, and he considered utterly impossible the proposal for 60,000,000,000 paper marks of new taxes. In this position the government was supported by all parties in the Reichstag except the Communists.

In German circles the reparations demands were regarded as a victory for President Poincaré over the British. The hope was expressed that further negotiations might lead to acceptable modifications.

UNITED STATES DEMANDS SHARE OF OCCUPATIONS PAYMENTS.—When Allied finance Ministers met in Paris on March 8 to consider the allotment of payments made by Germany to cover the cost of armies of occupation, Secretary of State Hughes sent a note requesting that the American army costs, amounting to about 1,000,000,000 gold marks, should be taken into consideration. In reply it was suggested that the United States should take up the matter directly with the Allied governments.

Accordingly on March 20 Secretary Hughes sent identic notes to each of the Allies setting forth the right of the United States to share in occupation payments on an equal footing with the Allied nations that had signed the Treaty of Versailles. Secretary Hughes based his claim on the provisions of the German Armistice. He assumed that if any technical objection were raised, it must be on the ground that the United States had not ratified the Treaty of Versailles; but since Germany by separate treaty had expressly recognized the validity of the American claims, such technical objection must rest "solely upon the refusal of the governments of the Allied Powers themselves to permit the discharge of an admittedly equitable claim and thus to seek to maintain in their behalf exclusively a first charge upon the assets and revenues of the German Government."

**FRENCH REPLY RECOGNIZES CLAIM.**—At the close of March the French Government sent a preliminary reply to Secretary Hughes' note stating that the French government had never questioned the right of the United States to payment and expressing confidence that a satisfactory settlement would be reached regarding the method of collecting the amount due. It was stated that the Allies would soon make a common reply to the American note. Speaking in the French Parliament, Premier Poincaré pointed out that the only question at issue was whether the United States should collect through the Allies or directly from Germany.

**RHINE TROOPS ORDERED HOME.**—On March 20 the U. S. War Department announced the decision of President Harding to withdraw before July 1 all American forces in Germany. A previous reduction was ordered on February 16, so that on April 1 there were only about 2,000 American officers and men in the occupation forces.

**AMERICAN AMBASSADOR TO GERMANY.**—Alanson B. Houghton, appointed American Ambassador to Germany, sailed from New York on April 1.

It was stated in Washington on March 28 that negotiations were in progress for a special treaty to adjust German and American claims growing out of the World War.

### GENOA ECONOMIC CONFERENCE

**PREPARATIONS FOR CONFERENCE.**—Early in March the Italian government sent out invitations for the conference at Genoa to begin on April 10, the date agreed upon by the Allied premiers in their meeting at Cannes. It was expected that the conference might continue as long as three months, though a large part of this time would be taken up with committee work, while political leaders would not be present throughout.

Experts from the Allied nations met in London on March 20 to agree upon matters of policy and upon definite plans for concerted action in the conference. Among the problems considered was the regulation of credits to be apportioned to these countries offering adequate security.

**UNITED STATES DECLINES TO TAKE PART.**—In the following note to the Italian Ambassador, Secretary Hughes signified the unwillingness of the United States government to take part in the Genoa Conference. and at the same time expressed the attitude of this government toward the problems before the conference:

Washington, March 9.

*Excellency:*

I have the honor to acknowledge the receipt of Your Excellency's note transmitting the invitation addressed by the Italian Government to the Government of the United States to take part in an "economic and financial" conference to be convened at Genoa pursuant to the resolution

adopted on January 6, 1922, by the Allied governments in conference at Cannes.

I have also received your later notes with respect to American representation, the proposed agenda, and the postponement of the date of the conference.

Since the receipt of Your Excellency's first note the question of American participation in the proposed conference has had the most earnest attention. I am sure that you will realize that the Government of the United States must take a deep interest in any conference which holds promise of effective measures to promote the economic rehabilitation of Europe, since not only do we keenly desire the return of prosperity to the peoples who have suffered most severely from the wastes and dislocations of war but it is also manifest that there can be no improvement in world conditions in the absence of European recuperation. It is with this sympathetic spirit, and with the utmost reluctance to withhold its support from any appropriate effort to attain this object, that the Government of the United States has examined the resolution adopted at Cannes and the suggested agenda for the conference.

I regret to inform Your Excellency that, as a result of this examination, it has been found impossible to escape the conclusion that the proposed conference is not primarily an economic conference as questions appear to have been excluded from consideration without the satisfactory determination of which the chief causes of economic disturbance must continue to operate but is rather a conference of a political character in which the Government of the United States could not helpfully participate. This government cannot be unmindful of the clear conviction of the American people, while desirous, as has been abundantly demonstrated, suitably to assist in the recovery of the economic life of Europe, that they should not unnecessarily become involved in European political questions.

It may be added, with respect to Russia, that this government, anxious to do all in its power to promote the welfare of the Russian people, views with the most eager and friendly interest every step taken toward the restoration of economic conditions which will permit Russia to regain her productive power, but these conditions, in the view of this government, cannot be secured until adequate action is taken on the part of those chiefly responsible for Russia's present economic disorder.

It is also the view of this government—and it trusts that view is shared by the governments who have called the conference—that while awaiting the establishment of the essential bases of productivity in Russia, to which reference was made in the public declaration of this government on March 25, 1921, and without which this government believes all consideration of economic revival to be futile, nothing should be done looking to the obtaining of economic advantages in Russia which would impair the just opportunities of others, but that the resources of the Russian people should be free from exploitation and that fair and equal economic opportunity in their interest, as well as in the interest of all the powers, should be preserved.

While this government does not believe that it should participate in the proposed conference, it sincerely hopes that progress may be made in preparing the way for the eventual discussion and settlement of the fundamental economic and financial questions relating to European recuperation which press for solution.

Accept, Excellency, the renewed assurance of my highest consideration.  
(Signed) CHARLES E. HUGHES.

His Excellency,  
Senator Vittorio Rolandi Ricci,  
Ambassador of Italy.

**VOTE OF CONFIDENCE FOR LLOYD GEORGE.**—On April 3 the British House of Commons supported Premier Lloyd George by a vote of 372 to 94 on the motion that "this House approve the resolutions passed by the Supreme Council at Cannes as the basis of the Genoa conference and will support His Majesty's Government in endeavoring to give effect to them." On the same date M. Poincaré was supported in the French Chamber by a vote of 484 to 78.

Speaking in the House on the motion quoted above, Premier Lloyd George outlined British policies for the conference, including restoration of trade, stabilization of exchange, reduction of land armaments, and limited recognition of Russia. On this last point he justified his policy by calling attention to the partial abandonment of communism in Russia, as shown by a speech of Lenine, and by citing the example of Pitt in dealing with revolutionary France.

**STRUGGLE FOR RUSSIAN OIL FIELDS.**—*Paris, March 15 (Special Cable).*—Undoubtedly a big struggle for the possession of the Caucasian oil fields is in preparation. The prospect of the conference at Genoa brought the matter to a head and at present great interest is taken in Caucasian naphtha by Russia, France, England, and America, or at least companies belonging to these various nationalities. The Standard Oil Company is naturally getting ready to put up a fight inside or outside the international gathering.

For the moment it is Royal Dutch, through the affiliated company Bataafsche Petroleum Maatschappij, which appears likely to obtain concessions which, according to the French, would constitute a monopoly. This Netherlands company is actually in negotiation with Soviet delegates, notably Leonid Krassin. But recent developments of Russian policy making for a repudiation of the method of parceling out the country make the situation doubtful.

As for the French, their view is simple. They are already at the mercy of great rival oil companies and have neglected to assure themselves of the oil sources in the world. They are opposed to any British monopoly and would be opposed to any American monopoly. They will not be left out of the Caucasus. At the meeting of experts in London next week this problem will probably be the chief problem, though it will not be treated with publicity. Should there be any secret agreement, France will consider that her interests have been jeopardized.—*Christian Science Monitor*, 16 March, 1922.

**LEAGUE NOT TO TAKE PART AT GENOA.**—*Paris, March 28 (By the Associated Press).*—The chances of the League of Nations' participating in the Genoa conference were reduced to a minimum today by the action of the Council of the League in simply referring to the general secretary Italy's invitation to send to Genoa technical experts from the League organization for consultative purposes.

It is known that Sir Eric Drummond, the League's general secretary, regards such partial and vague participation as is proposed in the invitation beneath the dignity of the League, and it appears probable he will find it inadvisable to take the League's technical men away from the work they are already engaged upon.

The Council today increased the membership of the mixed committee on disarmament, adding Lord Robert Cecil of England, Gustave Ador, former President of Switzerland; Francisco Nitti, formerly Premier of

Italy; M. Lebrun, formerly French Minister of Marine; Señor Gonzales Hontoria, formerly Spanish Minister of Foreign Affairs; and Señor Urrutia, Colombian Minister to Switzerland, and Prince Sapieha, formerly Polish Foreign Minister. This step was in response to a resolution passed by the committee on disarmament at its last meeting in Paris to the effect that the committee should be strengthened.

The Council also urged the committee to resume as soon as possible the active work of preparing a basis for the general disarmament plan which the Council will submit to the Assembly of the League next September.

**SMALLER STATES AT GENOA.**—*London, March 17 (Special Cable).*—The conference of Little Entente and Polish statesmen at Belgrade has concluded and a program has been agreed upon for presentation at Genoa. The Cannes proposals are to be adhered to generally and the common line of economic action agreed upon is intended to facilitate international trade, while leaving each state completely free politically. No state will interest itself in any question not directly affecting itself.

The Tzech legation here points out that the Belgrade agreement, contrary to report, does not constitute an alliance with Poland. The existing military alliance between Poland and Rumania in no way commits the little entente any more than the proposed Finnish-Polish military alliance will compromise the Baltic entente.

A conference of the latter states and Poland is to take place within a few days at Warsaw, when the Belgrade program will be proposed by the Polish representative for acceptance. If agreed upon, as expected, a powerful group will be formed that can act in conjunction with the allied group of Italy, France and Great Britain for the common good of Russia.—*Christian Science Monitor*, 18 March, 1922.

## NEAR EAST

**ARMISTICE FOR GREEKS AND TURKS.**—On March 22 the Allied Foreign Ministers, meeting in Paris to reach a settlement in the Near East, sent telegrams to Constantinople, Angora, and Athens proposing a three-months' armistice between Greek and Turkish forces, with a ten-kilometer zone between the two lines, and with the promise of ultimate Greek evacuation of Asia Minor. Both the Greek and the Constantinople governments accepted this proposal, the latter on the condition that the term of the armistice be limited to one month. Up to April 5, however, the Angora government had accepted only "in principle," and there appeared little prospect that it would submit unconditionally to the terms proposed by the western powers.

**PROPOSED PEACE TERMS.**—Forced to recognize the break-down of the Sévres Treaty and the failure of the Greek offensive in Asia Minor, the Allied Foreign Ministers at the close of March presented a solution of the Near Eastern question on terms far more favorable to Turkey than had previously been proposed. These terms were submitted to the Greek and Turkish governments with three weeks for consideration and reply. The chief features of the Allied proposals were as follows:

(1) Perpetual freedom of navigation in the Dardanelles and Bosphorus, with international control of the straits under the supervision

of the League of Nations, and the Greeks in possession of the Gallipoli peninsula.

(2) Turkish sovereignty throughout Asia Minor, while France and Great Britain retain all the former Turkish territory in Syria, Palestine, and Mesopotamia at present under their mandates.

(3) Smyrna to be evacuated by the Greeks, but with adequate protection for Greeks in the city proper.

(4) Armenia to be under Turkish sovereignty, but with the population under the protection of the League of Nations.

(5) Turkish control of Constantinople and an extension of her boundaries westward, though Greece holds Adrianople, the Gallipoli peninsula, and a part of Thrace.

INDIA SUPPORTS TURKISH CLAIMS.—A sensation was caused in England by the publication of a despatch from the Government of India to Edwin Montague, Secretary of State for India, urging the need of a revision of the Sévres Treaty favorable to Turkey, as a means of placating Mohammedan feeling in India. The publication of this despatch, without consultation with other members of the British Cabinet, resulted in Mr. Montague's forced resignation. While the note itself was not resented, its publication in this manner was regarded as an effort on the part of one dominion to dictate the foreign policy of the British Empire.

EGYPT AN INDEPENDENT KINGDOM.—On March 15 Sultan Ahmed Fuad Pasha assumed the new title of "King of Egypt," and issued a proclamation declaring the end of the British protectorate. Great Britain, however, retains control of Egyptian foreign relations, and reserves the power to protect British communications in Egypt, defend Egypt against foreign aggression direct or indirect, and guard foreign communities and interests, in the country.

### ITALY

Fiume Problem Unsolved.—Following the overthrow of President Zanelli in Fiume, the Jugo-Slav government on March 6 despatched a protest to Italy. The Italian government had already sent representatives to the city and assumed temporary control, forcing the resignation of Signor Giuriati, d' Annunzio's former chief of cabinet, who had taken charge of affairs. In reopening the Italian Parliament on March 16 Premier Facta emphasized his desire to carry out loyally the terms of the Rapallo Treaty. Up to the close of March, however, no solution of the Fiume problem had been reached. Zanelli at this time was in Jugo-Slav territory near the city with thirty-six members of the Fiume Assembly, the majority of which insisted upon his restoration.

### GREAT BRITAIN AND IRELAND

Compact Between Ulster and Irish Free State.—Following increased religious and partisan warfare in Belfast city and along the Ulster

boundary, the political leaders of both Ulster and the Free State agreed to a meeting with members of the British Cabinet in London on March 29-30. At this meeting a compact was signed embodying in brief the following terms: (1) A declaration of peace and pledge of co-operation to restore peace in disturbed districts; (2) organization of special police in mixed districts of Belfast, to consist half of Protestants and half of Catholics; (3) trials for serious crime in Northern Ireland, if so requested by either the accused or the prosecution, to be before two judges with no jury; (4) a committee of inquiry in Belfast, half Protestant and half Catholic, with an independent chairman; (5) another meeting, during the month after Free State has ratified its constitution, to consider the possibility of Irish union, or, failing this, a settlement of the boundary problem; (6) the British Government to submit to Parliament a bill providing £500,000 for relief work in Northern Ireland, to be distributed one-third to Catholics and two-thirds to Protestants, the Northern government endeavoring to secure the restoration of expelled Catholic workers; (7) release of political prisoners, and avoidance of inflammatory speeches.

BRITISH PARLIAMENT RATIFIES IRISH TREATY.—The Irish Treaty was ratified by the British Parliament and signed by the King on March 31. Amendments inserted by the House of Lords were finally eliminated, and the treaty was ratified in its original form save for one clause. This, suggested by the government, provided that the period of one month during which Ulster was to consider entrance into the Free State should begin upon ratification of the Irish Constitution by the British Parliament.

## UNITED STATES

AUSTRIAN LOAN EXTENDED.—*Special to The New York Times. Washington, March 15.*—The Senate by unanimous vote today passed the Lodge joint resolution for the release of America's lien upon Austria's state assets so as to enable the latter nation to raise a new foreign loan for the relief of women and children facing starvation in that portion of the former dual monarchy. Other creditor nations of Austria are ready to do likewise, but the delay on the part of the United States was holding up the whole plan for international relief for Austria and creating a most dangerous situation.

The resolution was:

The Austrian obligation held by the United States Grain Corporation for \$24,055,708.92, principal amount, is dated September 4, 1920, bears interest at six per cent payable semi-annually, and is due January 1, 1925. —*New York Times*, 16 March, 1922.

RECOGNITION OF MEXICO NEARER.—It was stated in Washington on March 19 that letters exchanged between President Harding and President Obregon had reduced the question of recognition of Mexico to a matter of time. The chief difficulty was as to whether formal guarantees for the protection of American oil and mineral rights in Mexico should accompany or follow after formal recognition.



## REVIEW OF BOOKS

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THE EVOLUTION OF NAVAL ARMAMENT by Frederick Leslie Robertson, Engineer Commander, R. N. Illustrated, 301 pages, indexed. Published by Constable and Co., Ltd., London, and by E. P. Dutton and Co. of New York City. Price \$7.00.

This book gives an historical account of the evolution of the ship, gun, and engine and their interdependence. While the material side is of necessity stressed, the bearing of tactics on the evolution of these elements of sea strength is made apparent.

The account sketches the historical beginning of each: the ship, gun and engine, and carries through their development in a lucid and interesting fashion.

One cannot but be impressed with the opposition by the naval fraternity in all ages to material progress. This is interesting, points a moral, and corroborates a recent article in the PROCEEDINGS. A reading of this book would well repay the naval officers for the historical background that it gives in the development of material. At the same time the avoidance of an ultra technical style makes it very readable for the layman. The writer speaks with authority for he gathered his information from the Admiralty library, the Royal United Service Institution and the British Museum.

The subjects of the chapters are:

- I. The Sailing Ship.
- II. The Smooth Bore Gun.
- III. The Steam Engine.
- IV. New Principles of Gunnery.
- V. The Carronade.
- VI. The Truck Carriage.
- VII. The Shell Gun.
- VIII. The Rifled Gun.
- IX. Propelling Machinery.
- X. The Ironclad.

A. S.



KEEP THE INSTITUTE INFORMED OF YOUR  
ADDRESS

It is earnestly requested that members send in their correct addresses whenever they make a change; for unless they do, we shall be unable to guarantee prompt delivery of their PROCEEDINGS, as issued.

SECRETARY AND TREASURER.

## NOTICE TO MEMBERS

More members, both regular and associate, are desired. Any increase in membership invariably means a larger number of articles submitted, and consequently an improvement in the PROCEEDINGS.

You are requested to send or give the attached slip to someone eligible for membership, urging him to join.  
By direction of the Board of Control.

Attention is invited to extracts from the constitution on the opposite page as to the requirements in making applications for life, regular and associate membership.

*To the Secretary and Treasurer,  
U. S. Naval Institute,  
Annapolis, Md.*

*Dear Sir:*

*Please enroll my name as a*  $\left\{ \begin{array}{l} \text{regular} \\ \text{associate} \end{array} \right\}$  *member of the U. S. Naval Institute from*

*Very truly yours,*

Members are liable for the payment of the annual dues until the date of the receipt of their resignation in writing. Annual dues \$3.00.

.....1922.

## NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-ninth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

### ARTICLE VII

Sec. 1. The Institute shall consist of regular life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nomination shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

### ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, \$3.50; enlisted men, U. S. Navy, \$3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

## SPECIAL NOTICE

### NAVAL INSTITUTE PRIZE, 1923

A prize of two hundred dollars, with a gold medal and a life membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the following pages are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1922 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1922. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1922 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and a number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

F. M. ROBINSON,

*Lieut. Commander, U. S. Navy, Secretary and Treasurer.*

## TOPICS FOR ARTICLES

### SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

The Naval Policy of the United States.  
The Navy: Its Past, Present and Future.  
The Fighting Fleet of the Future.  
Factors Governing American Naval Strength, Absolute and Relative.  
The Navy in Battle; Operations of Air, Surface and Underwater Craft.  
Escort and Defense of Oversea Military Expeditions.  
The Place of Mines in Future Naval Warfare and the Rules Which Should Govern Their Use.  
The Relation of Naval Communication to Naval Strategy.  
The Influence of Topography on Strategy.  
International Law.  
Principles on Which Should be Founded the Freedom of Neutral Shipping on the High Seas.  
The Present Rule of Neutrality Regarding Contraband and Blockade—Is It Justifiable in Ethics or in Expediency?  
What Will be the Status of the Submarine in International Law?  
Aircraft—Its Place in Naval Warfare.  
Aircraft, Practical Power of.  
Aircraft Warfare, Laws of.  
Aviation—Its Present Status and its Probable Influence on Strategy and Tactics.  
The Control of the Sea from Above.  
The Navy Air Service, Its Possibilities, Rôle and Future Development.  
The Anti-Aircraft Problem from the Navy's Viewpoint.  
Surface Craft, Future Rôle of.  
Armor or High Speed for Large Surface Vessels.  
Naval Gunnery of To-day, the Problems of Long Range and Indirect Fire.  
Mode of Design and Armament of Ships to Meet the New Conditions of Aerial and Sub-Surface Attack.  
Future Development of the Naval Shore Establishment.  
Naval Bases, Their Number, Location and Equipment.  
Strategic Requirements of the Pearl Harbor Naval Station.  
The Navy Yard as an Industrial Establishment.  
A Mobilization Program for the Future.  
Naval Organization from the Viewpoint of Liaison in Peace and War Between the Navy and the Nation.  
Organization of a Naval Communication Service.  
Scope of Naval Industry Activity and the Navy's Relation of Naval Strength.  
Social and Industrial Conditions in Relation to the Development of Naval Strength.  
The Future of the Naval Officers' Profession.  
The Naval Officer and the Civilian.  
The Naval Officer as a Diplomat.  
The Mission of the Naval Academy in the Molding of Character.  
The Limits of Specialization in Naval Training.  
The Training of Communication Officers.  
Navy Spirit—Its Value to the Service and to the Country.

Morale Building.

Military Character.

Amalgamation of the Supply Corps, Construction Corps and Civil Engineering Corps with the Line of the Navy.

The Influence of the Term of Enlistment on the Efficiency of the Service.

Shore Duty for Enlisted Men.

Physical Factors in Efficiency.

Health of Personnel in Relation to Morale.

America as a Maritime Nation.

Our New Merchant Marine.

The Adaptability of Oil Engines to all Classes of War Vessels.



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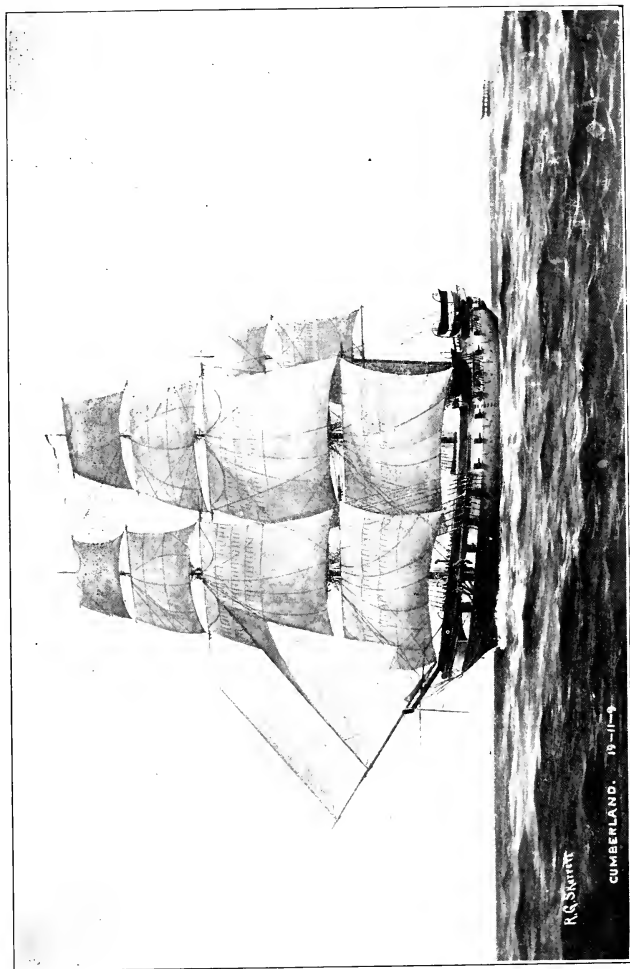
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1911





UNITED STATES SHIP "CUMBERLAND"

# UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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## ENGAGEMENT BETWEEN THE "CUMBERLAND" AND "MERRIMACK"

BY REAR ADMIRAL CHARLES O'NEIL, U. S. Navy, Retired

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The eighth of March, 1862, was a calm and beautiful day of early spring at Newport News, Virginia. It was Saturday and the frigate *Congress* and the *Cumberland* were lazily riding at anchor to the end of the flood tide at the mouth of the James River. There was a light breeze from the N. N. W., and nothing occurred to disturb the serenity of the forenoon. Commander Radford of the *Cumberland* was absent from the ship, being a member of a court of inquiry in session at Hampton Roads.

The crew had just had dinner when at 12:40 P. M., heavy black smoke was seen in the direction of Craney Island, and soon after the hull of a large vessel shaped like the roof of a house, with one smokestack, appeared in sight accompanied by two small steamers, steaming slowly in the direction of Sewell's Point. We knew at once that the large vessel was the former *Merrimack* which had been converted at Norfolk into an iron-clad and renamed the *Virginia*. We afterwards learned that she was commanded by Flag-Officer Franklin Buchanan of the Confederate States navy, and that the smaller vessels were the *Beaufort*, lieutenant commanding, W. H. Parker; and the *Raleigh*, lieutenant commanding, J. W. Alexander. At about the same time two steamers were

observed coming down the James River, which proved to be the *Patrick Henry* of twelve guns, Commander Robert R. Tucker; and the *Jamestown* of two guns, lieutenant commanding, W. A. Webb. As soon as the enemy's vessels were discovered, the sails, which had been loosed to dry, were furled; the wash clothes were piped down; the boats were lowered and dropped astern, springs were put on the port cable, to which the ship was riding, and the "quick beat" to quarters was sounded. The guns, which were already loaded, were double breeched; the pumps were rigged; the decks were sprinkled and sanded, and all the usual preparations for battle were made. In the absence of Commander Radford the *Cumberland* was for the time being in command of Lieutenant George U. Morris, who was the executive officer; Lieutenant Selfridge commanded the forward gun-deck division of five nine-inch guns on each side, and I was stationed in his division; the next four guns on each side were under the command of Moses S. Stuyvesant, the master, and the two after guns on each side were manned by marines. The forward ten-inch pivot gun on the upper deck was in charge of Acting Master Wm. N. Kennison, and the after pivot gun was in charge of Acting Master Wm. P. Randall. Sailmaker David Bruce and Gunner Eugene Mack were in charge of the powder divisions. The *Merrimack* kept on her way towards Sewell's Point, and owing to the contour of the land was lost to our view for nearly an hour, and we were uncertain as to her movements, and thought perhaps she had gone to Hampton Roads to attack the vessels there, but all doubts upon this point were dispelled when she again appeared in sight at about 2:30 P. M., heading directly for us. As we were heading downstream, our guns could not be brought to bear upon her and efforts were made to spring the ship, but owing to its being slack water, they were futile. Nor could we see the approaching enemy from the broad-side gun ports, as she was almost directly ahead of us, and while the guns' crews were waiting for an opportunity to open fire, I stepped forward to a bridle port in which there was no gun and had a good look at the *Merrimack* as she passed the *Congress*, only a short distance from us, when I was summoned back to my station.

She appeared to have one bow gun and three or four on each



side, and flew the Confederate flag, which at a distance looked not unlike the French flag.

As she passed the *Congress* that vessel fired a broadside into her at short range, apparently without effect, as she slowed down and manœuvred for position, ahead of us, and it seemed uncertain as to on which side we were to receive her attack. Her first shot at us swept across the quarter deck, crashing through the bulwarks and skylights, and mowing down some of the marines who were drawn up in that part of the ship. The crash and the cries of the wounded as they were carried below was the introduction to a scene of carnage and destruction which cannot be adequately described. Finally the *Merrimack* took a position three or four hundred yards distant, on our starboard bow, from which she delivered shot after shot at us, with precision from her seven-inch rifle gun which wrought terrific havoc among the men of the forward gun-deck division of the *Cumberland*, which received the brunt of the attack, while she herself was so far forward that none of our guns could be brought to bear upon her. Early in the engagement, a seven-inch shell from the *Merrimack* burst in the forward part of our gun deck, filling it with smoke, demolishing the galley, and practically wiping out the whole of No. 1 gun's crew, the captain of which, a man named Kirker who was formerly the commodore's coxswain, had both arms shot off. From her favorable position, the *Merrimack* kept up a deadly and destructive fire on our ship for from ten to fifteen minutes, during which we had swung slightly so as to expose more of our starboard side, when she started ahead under full steam and in a brief interval struck us a staggering blow below the water line, just forward of our starboard fore chains. The crash of timber could be heard as the *Cumberland* surged on her chain cable and reeled under the force of the blow. The two vessels lay motionless for some moments when the *Merrimack* cleared herself from the encounter and forged slowly ahead, presenting her starboard side to ours, and both vessels then opened fire on each other at a range not exceeding two hundred yards. In this position we had eleven nine-inch, one ten-inch, and one six-inch rifle guns bearing on the enemy, which were served with great rapidity, and the range was so short that it would have been next to impossible not to hit her.

The *Merrimack's* boats and flagstaffs were soon shot away; her smokestack was riddled, and the muzzles knocked off of two of her guns, but apparently her hull suffered but little, if any, from our heavy fire which would have demolished a wooden vessel in a short time. The shot and shell from the *Merrimack* crashed through the wooden sides of the *Cumberland* as if they had been made of paper, carrying huge splinters with them and dealing death and destruction on every hand. Many were killed outright and others wounded and terribly mangled, and the scenes in the cock-pit and sick-bay, whither the wounded were carried, must have been heart-rending. The dead on the gun deck were carried to the opposite, the port side, and the wounded sent below as fast as possible, their stations at the guns being filled by those remaining. Several shot and shell entered on one side and passed out through the other carrying everything before them, and the smoke, the booming of the guns, the crash of splintered wood-work and the cries and groans of the wounded, were appalling, but were offset in a measure by the cheering of the men at the guns, who fought with determination and enthusiasm. The once clean and beautiful deck was slippery with blood, blackened with powder and looked like a slaughter house, and was a scene of destruction and wreckage throughout. A couple of soldiers from the camp on shore were on board as visitors during the forenoon and as they could not get on shore they turned to and helped at the guns. They were both killed and could be distinguished from the sailors by their red shirts.

The water was rushing in through the rent made by the prow of the *Merrimack* and the pumps were manned, but they were inadequate as the water came in faster than it could be pumped out, and as it was only a question of time when the forward magazine would be flooded, whole tanks of powder for the forward guns were passed up on to the berth deck, and ultimately it became necessary to get powder from the after magazines for the entire battery. At one time the *Merrimack* came so near us that it looked as if she was coming alongside and our boarders were called away, and repaired with their cutlasses and pistols to the upper deck. My station required me to accompany them and I also went to the spar deck, but as the vessels drew apart, we were ordered back to our stations on the gun deck.

Our marines and such of the crew on the upper deck as were armed with rifles, were firing at the enemy's port holes in hopes of doing some execution, and subsequent reports showed that they did kill and wound some of the *Merrimack's* crew. In the meantime, the *Congress* had slipped her cable, set her jib and topsails and with the aid of the tug *Zouave* was run ashore, bows on, near Signal Point and saved from being sunk, but for another fate. Orders were given to slip our cable, and Master's Mate Harrington and myself were directed to attend to the matter. The ship was riding by the port chain and Mr. Harrington was to attend at the forward compressor, and I was to have the chain unshackled, further aft. My part was attended to all right, and finding that something had evidently gone wrong, I ran forward to see what the matter was, and looked round for Harrington and in a moment saw his lifeless body lying flat on its back, a shell having completely cut his head off, while the four men who were to tend the compressor were stunned, and spattered with the blood and brains of that unfortunate officer. The ship was gradually settling by the head and listing to port and it was evident that she was sinking, but the battle went on without interruption. Lieutenant Selfridge encouraged his men and certainly set them an example of courage and coolness. The guns from the battery on shore at Newport News, consisting of four Columbiads and one forty-two-pounder James rifle, kept up a steady fire on the enemy and with those of the Confederate vessels and our own created a din that was appalling and deafening. In from twenty to thirty minutes from the time we were rammed, the *Cumberland* had settled so far by the head that her gun-deck bow ports were within a foot or so of the water, and at this time Lieutenant Morris stepped down from the spar deck, and seeing that the ship must immediately sink, gave the order for the crew to save themselves, and then, but not till then, did they leave their stations. In a few moments more the water rushed in at the bow ports: the ship listed heavily to port and soon went down with a rush of escaping air in a seething whirlpool: her flag still flying, but carrying with her all the dead and wounded. The condition of those below decks, especially the wounded, must have been pitiful in the extreme, there being no possible escape for most of them. The ship sank in about fifty-four feet of water so that everything above the tops

was out of water, including the peak of the spanker gaff to which the colors were still flying, when she rested on the bottom. I made my escape through one of the hatches leading to the spar deck, and when I reached it the ship had heeled over so far to port that it was with difficulty that I ran aft along the waterways to the stern, where I threw off my coat and sword and jumped overboard and scrambled into the sailing launch, which with the rest of the boats was lying astern.

There were men in the water all about and among them I saw Lieutenant Morris, struggling by himself, so I passed him a boat-hook to take hold of, and drew him alongside, and with the aid of some others he was hauled aboard, saying, "Don't let go of me for I can't swim."

The men climbed into the various boats which were soon filled, and many who had escaped through the port holes and the forward hatches took refuge in the rigging until they were rescued by some of our boats later on, and all who got out of the ship were now practically safe as the enemy ceased firing at us when the ship went down, and made no attempt to molest us afterwards. As the ship heeled over in the act of sinking, some of the starboard guns got adrift and crashed across the deck, adding to the dangers to which the crew had already been exposed. In fact, the after pivot gun flew across the deck just after I had passed it. The boats pulled ashore and the survivors disembarked at the little wharf abreast the camp, and one of General Mansfield's aides, Captain Drake DeKay, who was on the wharf shouted rather excitedly to our men "to help man the battery on the bluff," and then left. As soon as our men were landed Lieutenant Morris took one of the cutters and pulled back to the ship to see if he could recover the flag and if any more men were to be found, and I went with him but we found neither. Lieutenant Selfridge pulled out in another cutter for the same purpose, and he informed me at a later period that he recovered the flag and took it on shore and rolled it up in a bundle and placed it under a sofa in General Mansfield's quarters, intending to get it when the excitement was over, and late in the day after the battle was over he went to look for it and it was gone. Who took it or what became of it has never been learned. The *Merrimack* had gone up the river a short distance to turn round, and having disposed of the *Cumber-*

land now turned her attention to the *Congress*. As I was on the gun deck throughout the engagement except during the brief interval when the boarders were summoned, I could not tell what took place on the upper deck, but on one or two points I have a decided opinion. It has been stated by what might be called good authority, that after the *Merrimack* had rammed us, she hailed us, demanding our surrender, and that Lieutenant Morris replied that "we would sink first." Lieutenant Morris makes no mention of this in his official report of the engagement, which it is true is very meager, making no reference to any details, nor does Flag Officer Buchanan in his report to the secretary of the Confederate States navy, which is very full, refer to such an incident. As the *Merrimack* struck us forward and Lieutenant Morris was aft, it would have been extremely difficult if not impossible for him to have heard a hail from the *Merrimack* amid the din of the cannonading, and no one on board of the *Merrimack* could have ventured outside of her armored casemate or pilot house without having been picked off by our sharpshooters. Moreover, as she had already given us our "coup de grace," it would seem foolish to demand the surrender of a sinking ship, so that I am very doubtful if the incident occurred. It has also been said that the *Merrimack* rammed us a second time, but if she did, I have no recollection of it nor do I think she did, for to have done so would have necessitated her abandoning a very favorable position off our starboard beam and making a complete circle which not only would have occupied several minutes but would have seriously interfered with her gun fire, and as Flag Officer Buchanan makes no reference to such a proceeding I am strongly of the opinion that it did not take place. The vessels lying in Hampton Roads could not see the *Merrimack* coming out from Norfolk until a good while after we did, owing to the interference of the land. As soon, however, as they saw her and found that she was heading for the James River, the *Minnesota*, a fifty-gun frigate, slipped her cable and started up the river to go to the assistance of the vessels lying off Newport News. The *Roanoke*, a sister ship to the *Minnesota*, which was lying in Hampton Roads with a broken shaft, was taken in tow by two tugs and also started for Newport News. When seven or eight miles from Fortress Monroe, the *Minnesota* grounded at about 3 P. M. and stuck fast in the mud.

The *Roanoke* proceeded some distance but got into three and one-half fathoms of water, and was aground aft, so she, with the aid of her tugs, was turned round and headed for Hampton Roads.

The sailing frigate *St. Lawrence*, also at Hampton Roads, was taken in tow by the U. S. S. *Cambridge*, and started for our relief, but she also got aground, but was gotten afloat again but too late to be of any assistance, so she returned to the Roads. While passing the batteries at Sewell's Point they opened fire on her and also on the *Roanoke*, one shot going through the foresail of the latter vessel and cutting away two of her shrouds. It was quite apparent that no relief was to be expected from the fleet at Hampton Roads, owing to its distance away, and to intervening shoal water. When Commander Radford learned that the enemy had come out and was heading for Newport News, he went on shore from the *Roanoke* and obtaining a horse, set out for that place, but long before he arrived there, his ship, the *Cumberland*, had been sunk. In his official report of the disaster to the navy department, Commander Radford gives the following list of officers saved from the *Cumberland*:

William Radford, Commander. (Not on board.)

George U. Morris, Lieutenant.

Thomas O. Selfridge, Jr., Lieutenant.

Moses S. Stuyvesant, Master.

William P. Randall, Acting Master.

William N. Kennison, Acting Master.

Charles Heywood, Lieutenant of Marines.

Lewis Smith (Civilian), Pilot.

Charles Martin, Surgeon.

Edward Kershner, Assistant Surgeon.

Edward B. Bell, Boatswain.

Eugene Mack, Gunner.

William L. Leighton, Carpenter.

David Bruce, Sailmaker.

Charles O'Neil, Master's Mate.

Henry Wyman, Master's Mate.

E. V. Tyson, Master's Mate.

Hugh Nott, Paymaster's Clerk.

Cramer Burt, Paymaster. (Absent on leave.)

Lewis Ketchum, Captain's Clerk. (Not on board.)

# Officers Killed

John Lenhart, Chaplain. (Drowned.)

John M. Harrington, Master's Mate. (Killed.)

Officers and men, when action commenced..... 376

Officers and men, when action was over..... 255

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Number of killed and drowned..... 121

At about 3:30 P. M. the *Merrimack* took a position astern of the *Congress*, at a distance of not over three or four hundred yards and opening fire on her, raked her fore and aft, and the smaller steamers kept up a continuous fire on her and the camp on shore, which replied from its battery. On January 13th, 1862, the *Congress* had paid off some three hundred of her crew, and owing to the difficulty of filling their places, Company D of the 99th Regiment, New York State Volunteers, under the command of Captain William J. McIntire, was detailed to help fill her complement and was on board at the time of the engagement with the *Merrimack*, as was also Second Lieutenant George Elder and eighty-seven enlisted men. Owing to the position taken by the *Merrimack*, the *Congress* could only bring her two stern guns to bear upon her, and these were soon disabled by the enemy's fire, one being dismounted and the other having its muzzle knocked off. Lieutenant Joseph B. Smith, who was in command of the *Congress*, was killed and the command devolved upon Lieutenant Austin Pendergrast. Commander William Smith, U. S. N., was also on board the *Congress*, having recently been in command of her, but had received his detachment, the command devolving upon Lieutenant Joseph B. Smith, who was killed as before stated.

The *Congress* being in a defenseless position, her decks being raked fore and aft by the enemy's shot and shell, and having lost many lives, and being on fire in several places, hauled down her colors at about 4 P. M. Lieutenant Pendergrast in his official report says "upon consultation with Commander William Smith, we deemed it proper to haul down our colors without further loss of life on our part."

This took place at ten minutes to four o'clock on the afternoon of March 8th, 1862. In a short time after, the Confederate States tug *Beaufort* ran alongside the *Congress* which had hoisted a white flag, and an officer from the tug boarded the latter and ordered

the men ashore, saying he would take the officers as prisoners and burn the ship. At this point, the troops on shore opened fire on the *Beaufort* with such effect that she was forced to retire in haste, some twenty of the crew of the *Congress* jumping on board of her, which were the only prisoners taken. As soon as the *Beaufort* was well clear, the *Merrimack* again opened fire on the *Congress*, whose boats had been lowered, and such of the crew as were left alive, jumped into them, taking the wounded with them, or swam ashore, and the ship, which was on fire in several places, was abandoned to her fate. Brigadier General Joseph K. F. Mansfield commanding the military post at Newport News, in his report to Major General John E. Wool, commanding the department of Virginia, says, concerning the surrender of the *Congress*, when she hauled down her flag and hoisted a white flag and ceased action, "The enemy then sent two steamers with Confederate flags flying, and made fast on either side of her (the *Congress*) with a view to haul her off or burn her. As soon as I saw this I ordered Colonel Brown of the Twentieth Indiana Regiment, then close at hand, to send two rifle companies (A and K) to the beach. The two rifle guns under Captain Howard, and a rifled Dahlgren howitzer manned by Master Stuyvesant and fourteen sailors of the *Cumberland* went into action from a raking position on the beach, covered by sand banks and trees against these steamers. We here had them at about 800 yards to advantage, and immediately they let go their hold on the *Congress* and moved out of range, with much loss. They endeavored to approach her again with a steamer and row boat but were beaten off with loss, till finally the *Merrimack* finding her prize re-taken, approached and fired three shots into her and set her on fire."

Flag Officer Franklin Buchanan, who commanded the *Merrimack* and whose brother Paymaster McKean Buchanan was on board the *Congress* in this engagement, makes the following remarks, in his official report to the Hon. S. R. Mallory, secretary of the Confederate States navy, under date of March 27th, 1862. "The carnage, havoc and dismay caused by our fire, compelled them (the *Congress*) to haul down their colors and to hoist a white flag at their gaff, and half mast another at the main. The crew instantly took to their boats and landed. Our fire immediately ceased, and a signal was made for the *Beaufort* to come within



hail. I then ordered lieutenant commanding, Parker, to take possession of the *Congress*, secure the officers as prisoners, allow the crew to land, and burn the ship. He ran alongside, received the flag and surrender from Commander William Smith and Lieutenant Pendergrast, with the side arms of these officers. They delivered themselves as prisoners of war on board the *Beaufort*, and afterwards were permitted at their own request to return to the *Congress* to assist in removing the wounded to the *Beaufort*. They never returned, and I submit to the decision of the department whether they are not our prisoners. While the *Beaufort* and *Raleigh* were alongside the *Congress*, and the surrender of that vessel had been received from the commander, she having two white flags flying, hoisted by her own people, a heavy fire was opened upon them from the shore and from the *Congress*, killing some valuable officers and men. Under this fire the steamers left the *Congress*—and I took it for granted that my order to Lieutenant Parker to burn the vessel had been executed, and waited some minutes to see the smoke ascending the hatches. The steam frigates *Minnesota* and *Roanoke* and the sailing frigate *St. Lawrence* had previously been reported as coming from Old Point, but as I was determined that the *Congress* should not again fall into the hands of the enemy, I remarked to that gallant officer, Flag Lieutenant Minor, 'That ship must be burned.' He promptly volunteered to take a boat and burn her, and the *Teaser*, lieutenant commanding, Webb, was ordered to cover the boat. Lieutenant Minor had scarcely reached within fifty yards of the *Congress* when a deadly fire was opened upon him, wounding him severely and several of his men. On witnessing this vile treachery (see note following) I immediately recalled the boat and ordered the *Congress* destroyed by hot shot and incendiary shell." (Note by C. O. N.: The term "vile treachery" used by Flag Officer Buchanan in his report was unwarranted, as the troops on shore had not surrendered and it was their duty to prevent as far as lay in their power the enemy from taking possession of the *Congress* even if she had struck her colors. In fact, they would have been culpable if they had not done their utmost to drive away the enemy. It does not appear that anyone who was attached to the *Congress* at the time of her surrender, participated in the act which Flag Officer Buchanan stigmatizes as "vile treachery.")

Flag Officer Buchanan also says in his report, referring to the *Cumberland*, "In about fifteen minutes after the action commenced we ran into her on starboard bow: the crash below the water was distinctly heard, and she commenced sinking, gallantly fighting her guns as long as they were above water. She went down with her colors flying."

Many years after this event, I made the acquaintance of Hunter Davidson at Buenos Aires, where he had charge of the Argentine steamer *Fulminante* which was used as a torpedo depot and mining school for the Argentine navy, and of John Taylor Wood at Halifax, Nova Scotia, both of whom were officers on board the *Merrimack* during the engagements off Newport News, and in Hampton Roads on March 8th and 9th, 1862, and we had many interesting talks with regard to them. The *Congress* having been set on fire by the enemy's projectiles continued to burn throughout the rest of the afternoon and evening; her loaded guns being successively discharged as the heat and flames reached them, until a few minutes past midnight when her magazine exploded with a loud report and she was completely wrecked. Lieutenant Pendergrast reported to the secretary of the navy the casualties which occurred on board the *Congress* on March 8th as follows:

Total number of officers and men on board at the beginning of the engagement.....	434
Total number accounted for, saved.....	298
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Number of killed, wounded, and missing.....	136
Number of wounded taken on shore.....	26
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Number of killed and missing.....	110
Number of wounded since died.....	10
<hr/>	
Total number of killed, missing, and died on shore.....	120

Lieutenant Pendergrast in his official report dated March 9th, 1862, gives the following version of the surrender of the *Congress*:

"At about 4:30 I learned of the death of Lieutenant Joseph Smith, which happened about ten minutes previous. Seeing that our men were being killed without the prospect of any relief from the *Minnesota*, which vessel had run ashore in attempting to get up to us from Hampton Roads; not being able to bring a single gun to bear upon the enemy, and the ship being on fire in several

places, upon consultation with Commander William Smith, we deemed it proper to haul down our colors without any further loss of life on our part. We were soon boarded by an officer from the *Merrimack* who said he would take charge of the ship. He left shortly afterwards and a small tug came alongside whose captain demanded that we should surrender and get out of the ship, as he intended to burn her immediately. A sharp fire with muskets and artillery was maintained by our troops on shore upon the tug, having the effect of driving her off. The *Merrimack* again opened fire upon us, although we had a white flag at the peak, to show that we were out of action. After having fired several shells into us she left us and engaged the *Minnesota* and the shore batteries. We took this opportunity to man the boats and send the wounded ashore.

"We then ourselves left, the ship being on fire near the after magazine and in the sick bay. In fact the ship was on fire from the commencement to the end of the action; three times in the sick bay and wardroom and twice in the main hold, produced by hot shot thrown from the *Merrimack*. I lament to record the deaths of the following officers: Lieutenant Joseph B. Smith; Acting Master Thomas Moore and Pilot William Rhodes (wounded), since dead."

It will be observed that there are some discrepancies between the reports of Lieutenant Pendergrast and Flag Officer Buchanan with regard to this affair, which was a peculiar one, the victors not being able to reap the fruits of their victory owing to the interference of our military forces. Under the circumstances there was nothing for the Confederate naval forces to do but to again open fire on the ill-fated *Congress* and set her on fire. During the time the Confederate officers were occupied with the surrender of the *Congress*, Flag Officer Buchanan was, according to his own account and report, disabled by a minié ball from shore which passed entirely through the fleshy portion of the left thigh, grazing the femoral artery and inflicting a serious wound, and the command of the *Merrimack* devolved upon her executive officer, Lieutenant Catesby, ap R. Jones, who reported: "Our loss is two killed and eight wounded; two of our guns have the muzzles shot off. The prow was twisted and the armor somewhat damaged;

the anchors and flagstuffs shot away, and smokestack and steam-pipe were riddled."

The officers of the *Merrimack* in this memorable engagement were as follows:

Franklin Buchanan, C. S. N. Flag Officer, commanding.  
 Catesby ap R. Jones, Lieutenant, Executive Officer.  
 Lieutenant Simms, C. S. N.  
 Lieutenant Hunter Davidson, C. S. N.  
 Lieutenant John Taylor Wood, C. S. N.  
 Lieutenant J. R. Eggleston, C. S. N.  
 Lieutenant W. R. Butt, C. S. N.  
 Captain Thom, Marine Officer, C. S. N.  
 Paymaster James A. Semple, C. S. N.  
 Surgeon D. B. Phillips, C. S. N.  
 Assistant Surgeon Garnett, C. S. N.  
 Midshipmen—Foute, Marmaduke, Craig, Littlepage, and Long.

It is fair to assume that Flag Officer Buchanan's report as to the time he was wounded, and how, is correct, and yet I have been told that a medal was presented to a corporal of marines, by his friends, who claim that he fired the shot which wounded the flag officer from the deck of the *Cumberland*, whereas the flag officer states that he received his wound by a ball from shore, long after the *Cumberland* was sunk, and I prefer to take his statement of the fact as the correct one.

The officers and men from the *Cumberland* who reached the shore became scattered throughout the camp at Newport News. Some went to the battery, and others were watching the attempts of the enemy to take possession of the *Congress*. After my return from the trip to the wreck of the *Cumberland* with Lieutenant Morris, I met our pilot, Mr. Smith, and with him walked down to the beach in the direction of the *Congress*, which had two white flags flying, her ensign having been hauled down. We saw the two tugs go alongside of her and also saw them driven off by the fire from the camp, after which the *Merrimack* again opened fire on the *Congress*. The shells were flying over our heads in a very uncomfortable manner, when we met Lieutenant Selfridge near some large trees. A shell came whizzing along, passing over our heads and the pilot and I involuntarily ducked our heads and each of us got behind a good-sized tree, seeing which Lieutenant Selfridge, who was very much affected, said,

"Don't dodge, I wish one would kill me; I'd rather be killed than be whipped," but we thought otherwise and our trees gave us a sense of security, if nothing more. We watched the proceedings until the *Congress* was abandoned and then went into the camp. Being minus a coat and being wet and beginning to feel cold, I went to the tent of one of the officers I knew and helped myself to a gray military overcoat and a pair of boots. The camp was of course under arms and it was thought that an attack would be made upon it from the rear, but none came.

When the destruction of the *Congress* was assured beyond a doubt, the *Merrimack* and her consorts withdrew at about 6 P. M., firing a few parting shots at the camp, and steamed in the direction of Norfolk.

We wandered about the camp and later I found my friend whose coat and boots I had taken, who not only insisted on my keeping them but also gave me a cap which was dry, whereas mine was wet and uncomfortable, so I gladly accepted it, and for the time being I was rigged out in soldier clothes. The darkness came on and there seemed to be no rallying place for our men, and we went from place to place, finding a few here and a few there. We managed to get some hot coffee and a bit of something to eat from some of the army officers, which was most acceptable, and we strolled to the rear of the camp which was protected by a stockade, behind which was a depression, and here we found quite a number of terrified women and children who had come up in the morning from Fortress Monroe to visit friends in camp, and as they could not get away they had been sent here during the engagement as the safest place.

It was now quite late in the day and finding ourselves quite adrift and not knowing what to do or where to go, Doctor Kershner, Pilot Smith and myself concluded that we would go down to Old Point and report ourselves to the senior officer at Hampton Roads, which of course was a very improper proceeding on our part as we should have remained at Newport News, but we were inexperienced and a good deal rattled by the events of the day, so off we started for a good ten-mile tramp along the shore. It was hard walking and we had to wade through a couple of small streams one of which was waist deep and the other deeper, which did not add to our comfort, and before our

journey was half over we were very tired. The doctor was completely done up, and we had to rest awhile on his account. He told us to go ahead and never mind him, but we would not do that but rested every now and then. After awhile we reached Hampton, Virginia, and went to the hospital there and got some good hot coffee and bread and butter which quite braced us up, and after a good rest and a smoke we set out again and reached Old Point at about ten o'clock at night, and went to Kimberly's store on the wharf, which stood about where the Hotel Chamberlin stood, where we were all well known and Mr. Kimberly took us in, gave us dry clothing and some supper and not only took care of us for the night, but supplied us afterwards with such money as we needed. Everybody who had been to Old Point knew Kimberly who had the only store there of any consequence, and supplied the ships with fresh provisions. There was great excitement at Old Point and as we were just from the scene of the engagement, we were objects of interest to many persons who wanted to learn the particulars about it. The quartermasters department of the army was busy sending steamers to the relief of the *Minnesota*, which was still aground, hoping to pull her off, but their efforts during the night were fruitless. We were told that the *Monitor* had arrived in Hampton Roads at nine o'clock that evening and had gone up to the *Minnesota*, but no one knew what she was or anything about her. We could see the light from the burning *Congress* over the point of land behind which lay Newport News, and a little after midnight she blew up in a spectacular manner, the fire having reached her magazines. This was certainly the most eventful day of my life, unless perhaps it was the day I left the *Oliver Putnam* in an open boat, during a storm in the Indian Ocean. It was the second time I had been obliged to abandon a sinking ship in a hurry, and with nothing but the clothes I stood in. Worn out with fatigue and excitement, I turned in a little after midnight and slept soundly until the morning. As I look back after the lapse of many years, I am surprised to find how little notice the navy department took of the gallant manner with which the *Cumberland* was fought in the face of such overwhelming odds. I cannot find among the official records of the navy department, published as *War Records*, that even a commendatory letter was written to Lieutenant Morris,

who commanded her in the memorable engagement with the *Merrimack*. There were no medals or thanks bestowed, which seems very remarkable compared with the Spanish-American war, after which medals were awarded for the most trivial engagements, and in some instances to ships which were not under fire. I cannot help thinking also of the cruelty of war.

Take for instance the case of the *Cumberland*: everyone on board knew from the moment she was rammed by the *Merrimack* that she would sink, and as the battle progressed it became more and more evident, and yet everyone was so intent upon fighting the enemy that no one, apparently, gave a thought to the great number of wounded men below the decks, and nothing was done to save them from the terrible fate which finally befell them when they were all drowned, for not one of them escaped. During the heat of the engagement no one would have thought of bringing them up from below and putting them, or some of them, into the boats, and in fact such a proceeding would have been impracticable while we were firing and under fire. The only way would have been to have ceased firing which meant to haul down our flag, which would have been equivalent to a surrender, which was something not to be thought of, and in consequence many wounded men were sacrificed to the horrible necessities of war.

#### THE "MERRIMACK" AND "MONITOR"

Sunday, March 9th, 1862. Notwithstanding the fatigue and excitement of the preceding day and the fact that I had but a few hours' sleep during the night, I was up bright and early the following morning and went down to the end of the wharf to look at the fleet then lying in Hampton Roads. The *Roanoke* and *St. Lawrence* were anchored between Fortress Monroe and the Rip Raps and there were several tugs, a few small gun boats, the *Cambridge*, *Mount Vernon*, *Mystic*, and the barque *Braziliera*, and a lot of army transports, both steamers and schooners, at anchor in various directions. The store ship *Brandywine*, a mastless hulk, was also at anchor in the Roads.

The *Minnesota* was still aground some seven miles above, and a large tug, the *Dragon*, and some quartermaster's steamers were trying to pull her off the bank on which she had grounded. The

Ericsson battery *Monitor* was near her, having reported alongside at 2 A. M. by order of Captain Marston, the senior naval officer present in the Roads, the commander-in-chief, Flag Officer Louis M. Goldsborough, commanding the North Atlantic blockading squadron, being then in the Sounds of North Carolina. The morning was mild and pleasant, with a slight haze which was dispelled as the sun got higher. There was scarcely any wind and the waters of the Roads were perfectly smooth.

After an early breakfast at Kimberly's, I went again to the wharf to wait until one of the *Roanoke's* boats should come in, and when one did come alongside a little later, I got a passage off to the ship in her and there reported to Captain Marston, my former captain on the *Cumberland*, who received me personally and congratulated me on my escape the day before and then asked me a number of questions regarding the battle, and as to affairs at Newport News. He overlooked the fact that I had left there without permission, and gave me authority to proceed home and report by letter to the navy department.

At about 8 A. M. the *Merrimack*, *Jamestown*, and *Patrick Henry* could be seen off Sewell's Point. At 8:45 A. M. the *Monitor* opened fire on the *Merrimack*, steaming slowly towards her. The *Merrimack* returned her fire, firing also at the *Minnesota*. and the two ironclads manœuvred about each other firing, sometimes at very close quarters, and then at longer range. Once the *Merrimack* succeeded in ramming the *Monitor*, striking her a glancing blow, but apparently doing her no material damage as she moved freely afterwards. Once the *Merrimack* got aground and backed her engines for fifteen minutes before she was again afloat. A shell from the *Merrimack* struck and blew up the boiler of the *Dragon* which was alongside of the *Minnesota*. The duel between the two ironclad vessels continued until noon, neither seeming to have gained any advantage over the other, though the withdrawal of the *Merrimack* early in the afternoon to Norfolk might be considered a victory for the *Monitor*. In this engagement, the *Monitor* was struck twenty-one times, viz.: pilot house twice; turret nine times; side armor eight times; deck three times. She expended forty-one solid cast-iron eleven-inch shot, and she was steered during the action by Quartermaster Peter Williams.



Commander John L. Worden, who commanded the *Monitor*, was injured in the eyes at 11:30 A. M. by the explosion of a shell from the *Merrimack* upon the outside of the sight hole in the pilot house, exactly opposite his eye, after which the vessel was in charge of her executive officer, Lieutenant S. Dana Greene. The *Monitor* carried two eleven-inch cast-iron smooth bore Dahlgren guns, which were muzzle loaders.

The *Merrimack's* battery consisted of two seven-inch and two six-inch Brooke rifles and six nine-inch smooth bore Dahlgren guns. While I was on board the *Roanoke*, a shot or shell from the *Merrimack* every now and then flew over the ship, and cut some of her rigging, and before she retired from the field it was thought she might make a dash into the Roads and try conclusions with the vessels there, and Captain Marston said to me, "It looks as if you might have another day of it." The *Minnesota* was struck a number of times and had three men killed and sixteen wounded and three men were wounded on the *Dragon* alongside of her. She fired a great many rounds at the enemy but apparently did her no damage. Her gunner reported ammunition expended as follows, viz.: 78 ten-inch shot; 67 ten-inch shell; 169 nine-inch shot; 180 nine-inch shell, and 35 eight-inch shell, a total of 529 rounds. Fearing that his vessel could not be got afloat Captain Van Brunt of the *Minnesota* had made preparations to abandon and destroy her, but the withdrawal of the enemy's vessels rendered such a course unnecessary. At two o'clock on the morning of Monday, March 10th, she was pulled off, having thrown overboard seven of her eight-inch spar-deck guns, and 150 of her crew were landed and in Fortress Monroe, according to the report of Colonel Wm. D. Whipple, assistant adjutant general. When afloat, the *Minnesota* proceeded to Hampton Roads and anchored there. Every one was jubilant when the *Merrimack* retired from the field though it was uncertain when she might return.

The *Minnesota* was undoubtedly saved from destruction by the presence of the shoal water around her, preventing the *Merrimack* from ramming her before the *Monitor* arrived. The arrival of the *Monitor* was most opportune, for had it not been for her presence the *Merrimack* could have made a clean sweep of every vessel in Hampton Roads.

Things soon quieted down on board the *Roanoke* and after lunch with the midshipmen I went on shore and as I was walking about I ran across one of the *Cumberland's* best men, Jerry Lamphry, who was the bo'sans mate of the gun deck, sitting on a pile of boards, "piping sweepers." He had strayed down to Old Point and had evidently had more grog than he was accustomed to. I knocked about until late in the afternoon and then took the Bay Line steamer for Baltimore.

Commander Worden of the *Monitor* was on board, being sent home for treatment, and he was accompanied by Commander Henry A. Wise, U. S. N.

While the battle between the *Merrimack* and *Monitor* was a notable affair it seemed tame enough to me as seen at a distance of three or four miles when compared with the stirring scenes and events of the preceding day. On Sunday morning, March 9th, the assistant secretary of the navy, Hon. G. V. Fox, arrived at Old Point having come from the capital as soon as the news was received there of the naval battle off Newport News. Before I left Old Point the store ship *Brandywine* was towed out by the *Mount Vernon*, which was to take her to Baltimore.

The appearance of the *Merrimack* created intense excitement throughout the North, especially in the seaports where there were grave apprehensions of a visit from this formidable craft which was credited with much greater scope of action than she really possessed, for the fact became known later that she could not safely venture outside the Capes of the Chesapeake, though within them she was a very formidable vessel against which we had nothing which could contend with any prospect of success except the little *Monitor*, so that any accident to the latter would be a national calamity. Had the *Monitor* had a fairly respectable armament she could easily have disposed of the *Merrimack*, but her two smooth bore eleven-inch guns of low velocity were of very little count even against thin armor of ordinary quality at short range.

I arrived at Baltimore early on Monday morning, March 10th, 1862, and took a train for New York where I arrived some time during the afternoon. I was a shabby-looking customer and no one seemed to care for my company, until an old gentleman who could not find a vacant seat in the car was obliged to share

mine with me. He looked at me once or twice and finally said, "Going home on leave, I suppose." This riled me and I said, "No, going home to get some clothes to wear so I can go back to duty again." This seemed to soften the old fellow who asked me several questions and finally I told him who I was and where I came from, which interested him very much, and as we proceeded on our journey he found opportunity to tell some of the other passengers, and before we reached New York I was quite a personage and a newspaper man urged me to go with him to the office of his paper, assuring me I would be well repaid for giving the version of an eye witness of the late battles, but I was not to be tempted and when we arrived in New York I got away from my new acquaintances and went to the Astor House to dinner, after which I had an hour or two to spare when I got a newspaper and read its version of the events I had witnessed and participated in, and in due time I took a night train for Boston and had the privilege of sitting up all night varied with some little sleep which I acquired in a very uncomfortable position curled up on an ordinary day car seat, with a billet of wood for a pillow which I took from the pile near the stove. It was rather cold and my feet felt several sizes too large for my boots, but morning came after what seemed a very long night, and we finally arrived in Boston and I made my way home to Roxbury, reaching there on Tuesday, March 11th, before breakfast, giving the family a surprise as they did not know what had become of me. I must have made a sorry figure in my gray soldier's coat and military cap, but that did not affect my welcome, and everything that could be done for my comfort and pleasure was done, and I was quite a hero among my old friends and neighbors. Before going on with my story this seems a suitable place to complete the history of the two vessels which had already become famous in history.

#### REAPPEARANCE OF THE "MERRIMACK"

During the battle between the *Merrimack* and *Monitor* the former was commanded by Lieutenant Catesby ap R. Jones, C. S. N., but after that she was placed in command of Flag Officer Josiah Tattnall, C. S. N., on March 25th, 1862, he being ordered to the defence of the waters of Virginia. The vessel which had been

lying at Norfolk since her engagement with the *Monitor* got under way on April 11th, 1862, and steamed down to Sewell's Point to within long range of the guns of the forts and ships at Old Point. She was accompanied by the *Jamestown* and some small gunboats. The *Jamestown* and *Raleigh* were sent to capture some merchant vessels which were at anchor inside of Hampton Bar, and they succeeded in bringing out the brig *Marcus* of Stockton, New Jersey, the brig *Saboah* of Providence, Rhode Island, and schooner *Catharine T. Dix* of Accomac, and these prizes were towed up to Norfolk, Virginia. The crews made no resistance and some of them escaped in small boats, but thirteen of them were captured. The *Merrimack* and her consorts then retired no demonstration against them having been made by the federal forces. She was made fast later to the buoy off Sewell's Point, and this was her last appearance. Various schemes for her capture or destruction, should she again appear, were made by our people and one or two large steamers were kept in readiness at Hampton Roads to run her down, should she again come out.

The easy victory of the *Merrimack* over the *Cumberland* and *Congress* startled the whole country. The secretary of the navy, Hon. Gideon Welles, relates what took place at a cabinet meeting called by President Lincoln immediately after the events at Hampton Roads and Newport News. "The *Merrimack*," said Stanton, "will change the whole character of the war: she will destroy seriatim every naval vessel. She will lay all the cities on the seaboard under contribution. I shall immediately recall Burnside: Port Royal must be abandoned. I will notify the governors and municipal authorities in the north to take instant measures to protect their harbors."

The *London Times*, after describing the battles, said, "Whereas we had available for immediate purposes 149 first-class warships, we have now but two, these two being the *Warrior* and her sister *Ironsides*. There is not now a ship in the English navy apart from these two that it would not be madness to trust to an engagement with that little *Monitor*." That these views were exaggerated was shown in the near future when it became known that both the *Merrimack* and *Monitor* were deficient in seagoing qualities and could fight only in smooth water, but this fact was not then known.

## DESTRUCTION OF THE "MERRIMACK"

On May 11th, 1862, at two minutes before five o'clock in the morning, the *Merrimack* blew up. She was set on fire by her own people at about three o'clock and her destruction was made the subject of a general court martial convened in Richmond, Virginia, on July 5th, 1862, to try Flag Officer Josiah Tattnall S. C. N. The court was composed of Captains Lawrence Rousseau, Franklin Buchanan, and Sidney S. Lee; Commanders Robert G. Robb, Murray Mason, Eben Farrand, A. B. Fairfax, M. F. Maury, and Robert B. Pegram. To this detail Captain George N. Hollins was subsequently added. Mr. Robert Ould was appointed judge advocate. The charges were: First. Culpable destruction of an armed steamer of the Confederate States navy. Second. Negligence. Third. Improvident conduct, to which the accused pleaded "Not Guilty." The trial lasted about twelve days and resulted in the honorable acquittal of Captain Tattnall.

## HISTORY OF THE "MERRIMACK"

The steam frigate *Merrimack*, of 3,200 tons displacement, was one of a group of five vessels which were built about the year 1855.

The others were the *Minnesota*, *Colorado*, *Wabash*, and *Roanoke*. At the time they were built they were without exception the finest specimens of naval architecture afloat, and were much admired wherever they went. They were full ship-rigged, having auxiliary screw engines, and were designed to hoist their single screws when under sail. They had fine sailing qualities and when under a full spread of canvas presented an imposing appearance. The *Merrimack* was launched June 14th, 1855, at the Boston navy yard. Her hull cost \$513,778 and her machinery, which was built under contract by R. P. Parrot at Cold Spring on the Hudson, cost \$172,064, making the cost of hull and machinery \$685,842. She was completed in February, 1856. Her length was 275 feet—beam thirty-eight feet six inches—and her draft when ready for sea was twenty-two feet eleven inches forward and twenty-four feet three inches aft. Her original battery consisted of fourteen eight-inch guns of sixty-three cwt., and two ten-inch pivots on the spar deck, and twenty-four nine-inch Dahl-

grens on the gun deck, all being cast iron, smooth bores. She was first commissioned at Boston on February 20th, 1856, under the command of Captain G. J. Pendergrast, and on April 19th when in the Severn River, below Annapolis, she was visited by the President, the secretary of the navy and a number of Congressmen. During this commission she visited Havana, Key West, Boston, New York, Southampton, Brest, Lisbon, Cadiz, Barbadoes, St. Thomas and Hampton Roads, and was put out of commission at Boston on April 22nd, 1857. She was re-commissioned at Boston on September 1st, 1857, under the command of Captain R. B. Hitchcock and for a few months was flag-ship of the Brazil station, flying the flag of Commodore J. C. Long. In January, 1858, she went round Cape Horn and became the flag-ship of the Pacific station, visiting Valparaiso, Pisco Bay, Callao, Payto, Panama, Honolulu, Acapulco and Realijo. On August 17th, 1859, Flag Officer Long was relieved by Flag Officer J. B. Montgomery, who on October 14th, 1859, shifted his flag to the *Levant*, the *Merrimack* being ordered home. She was at Rio de Janeiro on December 17th, 1859, in Hampton Roads February 4th, 1860, and was put out of commission at the Norfolk navy yard February 16th, 1860, and was there when the war broke out in 1861 and was burned and sunk by the Federal forces on Saturday, April 20th, 1861, and was raised by the insurgents May 30th, 1861, and was by them cut down and converted into an ironclad and was completed in March, 1862. On March 8th, 1862, she engaged and destroyed the *Cumberland* and *Congress* off Newport News, Virginia, and on March 9th, 1862, she fought the *Monitor* and retired to Norfolk, neither vessel having been defeated. On May 11th, 1862, she was set on fire and destroyed by her own officers and crew off Craney Island, just below Norfolk. Such is the brief history of one of the most notable vessels that was ever built. This vessel might have been saved to the Union if a little more nerve and decision had been displayed by the naval authorities at Norfolk and by the government at Washington.

The following extracts from *The History of the U. S. Navy Yard at Gosport, Virginia* (near Norfolk) by Commander Edward P. Lull, U. S. N., written in 1874, throw some light on the subject as he says: "She (the *Merrimack*) was reported ready to leave the navy yard, two days previous to her destruction, every

preparation having been made by Commander James Alden, even to engaging a pilot; the coal and the engineer's stores were on board and forty-four firemen and coal heavers had been engaged for the trip to Philadelphia. For some reason the necessary orders to depart were withheld by Commodore C. S. McCauley, the commandant of the navy yard, and two days later she, with the following vessels, were set on fire and scuttled by the Federal forces which were then in possession of Norfolk:

Ship of the Line *Pennsylvania*, 120 guns. Receiving Ship.

Ship of the Line *Columbus*, 74 guns. In ordinary.

Ship of the Line *Delaware*, 74 guns. In ordinary.

Ship of the Line, *New York*, 74 guns. On the stocks.

Frigate *United States*, 50 guns. In ordinary.

Frigate *Columbia*, 50 guns. In ordinary.

Frigate *Raritan*, 50 guns. In ordinary.

Sloop *Plymouth*, 22 guns. Ready for sea.

Sloop *Germantown*, 22 guns. Ready for sea.

Brig *Dolphin*, 4 guns. Ready for sea.

The U. S. S. *Cumberland*, twenty-four guns, the flag-ship of Flag Officer Pendergrast, commanding the home squadron, was lying off the Norfolk navy yard, fully manned. She had been under orders to proceed to Vera Cruz, but these orders had been countermanded. The navy department had ordered Commodore Hiram Paulding on April 18th, 1861, to proceed to Norfolk forthwith, to take command of all the naval forces there afloat, vesting him with full power to command the services of the entire naval force and directing him if necessary to repel force by force, in carrying out his instructions. The U. S. S. steam sloop *Pawnee*, Commander S. C. Rowan, then at Washington, was placed at his disposal and on April 19th, 1861, Commodore Paulding with the other officers detailed to assist him embarked on board of her, received one hundred marines from the Marine Barracks and proceeded to Fortress Monroe, where he arrived on the afternoon of the twentieth. Colonel Wardrop's regiment of Massachusetts volunteers were embarked and at 6:45 P. M. the *Pawnee's* head was turned towards Norfolk. At 8 P. M., April 20th, less than two hours after leaving Fortress Monroe, the *Pawnee* appeared in sight of the navy yard and ships and proceeded to the yard

where Commodore Paulding learned that he was too late: that the ships he had been sent to save were already rapidly sinking at their moorings. An examination was at once made to see whether it was possible to arrest the leaks and save the vessels, but it was found to be too late. The only alternative left to Commodore Paulding was to complete the destruction of the property as he had not the means at his disposal to defend it, nor was there any prospect of further aid from the government. It was imperatively necessary to send the *Pawnee* back for the defence of Washington. The *Cumberland* was a sailing vessel and was in a measure helpless and there was danger that the insurgents might barricade the channel below Norfolk and prevent her egress. Preparations were made for setting fire to the ships and the shops, and several barrels of powder were placed in one of the culverts of the dry-dock, everything being ready at 1:45 A. M. of Sunday, April 21st, 1861. At 2:25 A. M. the *Pawnee* left the wharf and passed hawsers to the *Cumberland* and at 4 A. M. the latter slipped her moorings, the tide then serving, and the two vessels, assisted by the chartered steamer *Yankee*, started down the river. The *Cumberland* and *Pawnee* picked up their boats and stood down for Hampton Roads, the former vessel hanging for some hours near Sewell's Point, having struck on the obstructions which had been placed in the channel, but was finally dragged off with the assistance of the chartered steamers *Keystone State* and *Yankee*. Within a month after the *Merrimack* had been burned and scuttled, she was raised by the Confederates. On April 25th, 1861, her battery was removed and despatched to Sewell's Point and other places for the defense of Norfolk, and the vessel was placed in the dry-dock, which had been repaired sufficiently to receive her. "The work of her transformation into the *Virginia* began immediately by cutting her down to her old berth deck to within three and a half feet of her light waterline. Both ends for seventy feet were covered over, and when the ship was in fighting trim were just awash.

"On the midship section, for a length of 170 feet was erected, at an angle of forty-five degrees, a roof of pitch pine and oak twenty-four inches thick, extending from the water line to a height over the gun deck of seven feet. Both ends of this structure were rounded, so that the pivot guns could be used as how



and stern chasers and on the bows and quarters. Over the gun deck structure was a light grating, making a promenade about twenty feet wide and nearly 170 long. The iron plating which covered the wood backing was rolled at the Tredegar Iron Works at Richmond and was two inches thick. The under layer being placed horizontally, and the upper laid up and down, the two being four inches thick, were bolted through the wood and clinched inside.

"The *Virginia* thus armored was further provided with a cast-iron prow or ram which projected four feet, but it was imperfectly secured as the test of battle proved. Another defect was the unprotected condition of the rudder and propeller. The pilot house was forward of the smokestack, and was covered with the same thickness of armor as the casemate. The motive power of the old *Merrimack* propelled the new *Virginia*, but it was so radically defective that both engines and boilers had been condemned during the last cruise of the *Merrimack*. The armament of the *Virginia* consisted of two seven-inch rifle guns, heavily reinforced around the breech with three-inch steel hoops, shrunk on. They were the first heavy guns so made in this country, and were the work of Lieutenant Brooke, C. S. N., and these guns formed the bow and stern chasers of the battery; there were also two six-inch guns of the same make, and six nine-inch smooth bores in broadside, making ten guns in all." (The above is from Sharf's *History of the Confederate Navy*, pp. 152 and 153.)

#### HISTORY OF THE "MONITOR"

The U. S. S. *Monitor* was built under contract with John Ericsson for the sum of \$275,000. Her keel was laid in the shipyard of Thomas F. Rowland at Greenpoint, Brooklyn, in October, 1861, and she was launched on January 30th, 1862. On February 25th, 1862, she was commissioned and turned over to the government, and nine days later she left New York for Hampton Roads.

The following is an extract from *Battles and Leaders of the Civil War*, page 719. "The length of the *Monitor* was 179 feet, beam forty-one feet six inches: tonnage 776: armament two eleven-inch Dahlgren guns.

"The crew was composed of volunteers, Lieutenant Worden having been authorized by the navy department to select his men from any ship of war in New York harbor, addressed the crews of the *North Carolina* and *Sabine*, stating fully to them the probable dangers of the passage to Hampton Roads, and the certainty of having important service to perform after arriving. The sailors responded enthusiastically, many more volunteering than were required." Her appearance in Hampton Roads and the services rendered by her in those waters have already been described. She remained in that vicinity a little over nine months and then was ordered to Charleston, S. C., and was taken in tow by the U. S. S. *Rhode Island* and when twenty miles S. S. W. of Cape Hatteras on December 31st, 1862, she foundered, being under the command of Commander Bankhead. She took in water around her turret and probably sprung a leak as well. Occasional comments appearing in the newspapers, intimating that there had been opposition on the part of naval officers to the building of the *Monitor*, induced me to write the following article.

Navy Department,  
Bureau of Ordnance,  
Washington, D. C.  
March 14, 1901.

To the Editor of the *Army and Navy Journal*.

Sir:

It is not infrequently stated that there was much opposition on the part of naval officers to the building of the original *Monitor*, and it has even been stated that it was only accomplished by the direct intervention of the President.

That such was not the case appears in Senate Document No. 86, 2nd Session, 40th Congress, entitled "Letter of the Secretary of the Navy, communicating in compliance with a resolution of the Senate of the 24th inst. (July, 1868) information in relation to the construction of the iron-clad *Monitor*."

As nearly forty years have elapsed since the inception and construction of this remarkable vessel, it may be of interest to many of your readers to learn the true facts of the case, which are taken from the official document above referred to.

At the extra session of Congress, which convened on the 4th of July, 1861, pursuant to the proclamation of President Lincoln, a report was submitted by Hon. Gideon Welles, secretary of the navy, in which he adverted to the fact that other governments were constructing armored

vessels, and he recommended that initiatory measures should be taken by our government for the construction of "one or more iron-clad steamers or floating batteries."

Congress responded promptly and liberally to this recommendation, and on August 3rd, 1861, passed an act authorizing and directing the secretary of the navy to appoint a board of three skilful naval officers to investigate the plans and specifications that might be submitted for the construction or completing of iron- or steel-clad steamships or steam batteries, and appropriating the sum of \$1,500,000 for the construction of one or more of the same, should the plans be approved.

On August 7th, four days after the passage of the above act, the navy department issued an advertisement "for the construction of one or more iron-clad steam vessels of war, either of iron or of wood and iron combined, for sea or river service, to be of not less than ten nor more than sixteen feet draft of water: to carry an armament of from eighty to one hundred and twenty tons weight, with provisions and stores for from one hundred and sixty-five to three hundred persons, according to armament, for sixty days, with coal for eight days. . . . The vessels to be rigged with two masts with iron rope standing rigging, to navigate at sea.

"Propositions to be received for twenty-five days."

From the above it will appear that the navy department lost no time in carrying out the provisions of the act of Congress above referred to.

On the following day (August 8th, 1861) the secretary of the navy appointed a board of three distinguished officers to investigate such plans as might be submitted. This board was composed of Commodore Joseph Smith, Commodore Hiram Paulding, and Captain Charles H. Davis.

The secretary of the navy visited Connecticut early in the month of September, 1861, and while at Hartford, C. S. Bushnell, Esq., of New Haven brought to him the plans of the original *Monitor* designed by Captain John Ericsson of New York. It received the instant favorable approval of the secretary, who requested Mr. Bushnell to proceed to Washington without delay and submit it to the board then about to decide on the plans presented. He was assured that in case of unavoidable delay beyond the time limited for receiving proposals, an exception should be made in favor of this novel invention of a submerged vessel with a revolving turret, and that it should be embraced among the plans on which the opinion of the board would be required. In compliance with the suggestion made at the interview in Hartford, Mr. Bushnell proceeded to Washington and exhibited his plans to the board. On September 16th, 1861, the board submitted its report which embraced the plans presented by seven-teen bidders.

Three propositions were favorably considered, namely, those of John Ericsson of New York, C. S. Bushnell of New Haven, and Merrick and Sons of Philadelphia. With regard to Ericsson's design the board remarks: "This plan of a floating battery is novel, but seems to be based upon a plan which will render the battery shot- and shell-proof. We are somewhat

apprehensive that her properties for sea are not such as a seagoing vessel should possess, but she may be moved from one place to another on the coast, in smooth water. We recommend that an experiment be made with one battery of this description on the terms proposed, with a guarantee and forfeiture in case of failure in any of the properties and points of the vessel as proposed."

Price \$275,000; length of vessel 172 feet; breadth of beam forty-one feet; depth of hold eleven feet six inches; time 100 days; draft of water ten feet; displacement 1,255 tons; speed per hour nine statute miles. On October 4th, 1861, the navy department entered into contract with Mr. Ericsson for a vessel on his plan, which was described as "an iron-clad, shot-proof steam battery of iron and wood combined." Payments were made as the work on the vessel progressed, there being five payments of \$50,000 each and one of \$25,000, each with a reservation of twenty-five per cent; the reservations amounting to \$68,750 being paid on March 14th, 1862.

The *Monitor* left New York for Hampton Roads on March 6th, 1862, reaching the latter place on March 8th, and on the following day (the 9th) she had her memorable encounter with the Confederate iron-clad *Merrimack*. About this time erroneous statements were current that "certain parties built the *Monitor* at their own risk, having agreed not to call upon the government for remuneration until the vessel had been tested in action. Strong in faith, receiving but a negative support from the navy department, they completed the *Monitor* at their own cost," and an affirmation was made on the floor of the House of Representatives that "a member from New York advanced the money and paid the entire expenses out of his own funds, in order to get the *Monitor* built, which met the *Merrimack* in Hampton Roads." Whereas in point of fact, the money which was applied to build the *Monitor* was appropriated by Congress on the recommendation of the secretary of the navy in August, 1861. The plan of the *Monitor* was submitted to him as above stated in the early part of September, 1861, and was sent by him at once to the board which he had appointed, was favorably reported upon by that board and a contract for its construction was entered into immediately. Although the department received but little encouragement from any quarter in regard to this novel experiment, its confidence in her success was unshaken. After the wonderful achievement of the *Monitor*, the tone of many was changed, and there were then persistent efforts to deny the department any credit for the adoption or construction of the *Monitor*. These misrepresentations led the inventor, Mr. Ericsson, to write the following letter which constitutes a part of the history, called for in the resolution of the Senate.

New York, April 25th, 1862.

"Sir:

"In your remarks on the administration of the navy department in today's *Herald* you have inadvertently done the secretary of the navy great

injustice relative to the construction of the *Monitor*. A more prompt and spirited action is probably not on record in a similar case than that of the navy department as regards the *Monitor*. The committee of naval commanders appointed by the secretary to decide on the plans of gunboats laid before the department occupied me less than two hours in explaining my new system. In about two hours more the committee had come to a decision. After their favorable report had been made to the secretary, I was called into his office, where I was detained less than five minutes. In order not to lose any time, the secretary ordered me to 'go ahead at once.' Consequently, while the clerks of the department were engaged in drawing up the formal contract, the iron which now forms the keel plate of the *Monitor* was drawn through the rolling mill.

"I am, respectfully, your obedient servant,"

J. ERICSSON.

To James Gordon Bennett, Esq.

Hon. Gideon Welles, then secretary of the navy, in submitting the foregoing to the president of the senate, says:

"To the distinguished inventor of this new-class vessel, to his sureties, to the board of naval officers who reported in her favor, to the vigilant and very able naval officer who superintended her construction, the secretary has on repeated occasions tendered his obligations and his thanks for their patriotic services in coming to the assistance of the department and the government in a great emergency.

"Great praise and commendation are due to them respectively, but no one can be justified in attempting to arrogate to himself undue merit at the expense of the others.

"Under misapprehensions and misstatements that have been made in regard to this vessel, it is proper that the real facts should be made public, and the department has gladly embraced the opportunity in communicating the official documents, records, and facts connected with the construction of the ironclad *Monitor*."

From the foregoing it will appear that instead of opposition on the part of the navy department or officers of the navy to the building of the *Monitor*, the scheme received their hearty approval and co-operation. It is possible and probable that the proposed vessel did not commend itself to all the officers of the navy, but it is quite evident from the above that no serious opposition manifested itself, notwithstanding frequent assertions to the contrary.

Respectfully,

CHARLES O'NEIL, Rear Admiral, U. S. Navy.



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## U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

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### INTRODUCTION

The author of this article, Lieutenant Commander Fedotov, was, in 1914, at the outbreak of the world war, attached to the imperial Russian embassy in Washington, D. C., as assistant naval attaché. He returned to Russia and was assigned to duty in the Baltic fleet, where, at the time of the revolution in March, 1917, he was in command of a destroyer. His ship took part in a number of mine-laying expeditions off German ports and was in several engagements with enemy light forces.

In May, 1917, Lieutenant Fedotov was detailed as naval aide to the special diplomatic mission of the United States of America to Russia, headed by Senator Elihu Root. He accompanied the naval member, Rear Admiral James H. Glennon, U. S. N., with his staff, to all the naval ports of Russia, including Archangel, Sevastopol, and Baltic Sea bases.

In November, 1917, when the Bolsheviki overthrew the provisional government in Russia, Lieutenant Fedotov went to England and was enrolled in the naval reserves with rank of lieutenant. He was given command of a ship and took an active part in the British operations at Archangel, where he was so seriously shell-shocked that he was retired from active service and decorated with the Distinguished Service Cross.

Upon recovering from his wounds, he made his way to Siberia and commanded a battalion of marines in the army of Admiral Kolchak, where his troops engaged in all the operations against the Bolsheviki until the Kolchak government collapsed.

Mr. Fedotov went from Irkutsk to Moscow where he lived under an assumed name until recently, when he managed to leave Russia and came to the United States via England. While in England he arranged for the publication of a series of articles in several British periodicals.

## THE RUSSIAN NAVY AND THE REVOLUTION

BY DIMITRI FEDOTOV, EX-LIEUTENANT COMMANDER, IMPERIAL  
RUSSIAN NAVY

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"The inveterate habit of insubordination of the seamen of the Western Ports, reduced almost to naught all the efforts of the Naval Commissioners."

—*Najac Lettres de l'Ordonnateur de la Marine, France, 1798.*

## THE FIRST DAYS OF THE REVOLUTION IN THE NAVY

At the outbreak of the March revolution in 1917, the attitude towards it of all the Russian navy, with the exception of divisions and ships stationed at Kronstadt, was one of cautious expectation. Neither in Reval nor in Helsingfors nor in Sevastopol, was there any organized revolutionary action. In Petrograd the second naval division vigorously resisted the revolutionary units of the Guards Infantry Depots, and at Tsarskoe Selo the naval guards battalion protected the imperial family from the outrages of the revolted soldiers of the Guards Rifles' Depot. It was only at Kronstadt that a bloody insurrection of the shore detachments culminated in the murder of the energetic Admiral Viren, who had distinguished himself at Port Arthur, and of a number of naval officers. In all the other ports the change of authorities took place peacefully, and almost everywhere on the initiative and under the direction of the officers in command, who recognized the provisional government as the lawful power in the country. Admiral Kolchak in Sevastopol and Admiral Nepenin in Helsingfors had succeeded, it seemed, in averting a mutiny.

However, the flame of the seamen's insurrection was rapidly transmitted from Kronstadt to Helsingfors, to which result much was contributed by the wireless messages sent by the leaders of the Kronstadt rebellion. The commander-in-chief and the officers of the squadron stationed at Helsingfors had already recognized the revolutionary government when that cruel and aimless outburst arose on the battleships *Emperor Paul* and *Andrey Pervozvanny*, the victims of which were Admirals Nepenin and Nebolsin, and scores of naval officers. This outburst destroyed every chance of preserving discipline in the Baltic fleet, all the more so that the provisional government did not even attempt to punish the murderers, although their victims had been agents of



this very government, recognized by them. In Reval there were no tragic events, but what had happened in Kronstadt and Helsingfors could not fail to leave a strong impression on the crews of the ships stationed there—the impunity of the Helsingfors murderers was a fatal blow to discipline, and an abyss that could not be bridged was opened between the officers and the men. In the Black Sea fleet things went on somewhat better, and Admiral Kolchak was able for several months to keep his men within the limits of discipline. But even here relations between officers and men were steadily becoming anomalous and the ship organization was gradually disintegrating.

The outrages committed in the Russian navy in the course of the revolution are widely known, but the causes which led to these outrages on board ships and in the naval barracks *after* the revolution had been accomplished, and consequently without any political reason, have hardly been investigated. The current explanation is that the massacres came as a result of the alleged cruelty of the officers towards the men, and of the great material hardships under which the crews had had to live.

The author of the present sketch was, at the outbreak of the revolution, commanding officer of a destroyer in Reval, and had in the course of the first few weeks following ample opportunities of conversing with some of the most revolutionary elements among the seamen and of discussing with them the events in Kronstadt and Helsingfors. Besides his personal observations, the author, who was editor of the *Navy Review* (*Morskoy Sbornik*) of Petrograd for several months in 1917, has collected numerous letters of officers from Helsingfors and Kronstadt, articles from the seamen's revolutionary press, and accounts of meetings held by naval units in various ports, as well as reports of members of the Duma, who were sent to investigate the situation on the ships of the Baltic fleet in March, 1917.

The study of this extensive material and a comparison with similar facts which took place in the French navy during the great revolution, in the British navy at the close of the eighteenth century, and in the German navy immediately before the armistice—have brought the author to the following conclusions as to the origin of the tragic collisions between the officers and the men

of the Baltic fleet. The causes which led to them may be brought under three principal headings :

- (1) Causes originating in the conditions of service in a navy in general, irrespective of its nationality.
- (2) Causes originating in the peculiarities of the regulations and of the organization of service on board and on shore in the Russian navy.
- (3) Causes not depending on the conditions of naval service.

The author has endeavored impartially, *sine ira et studio*, to investigate the causes belonging to each of these three categories and to ascertain their relative importance in producing among the seamen that state of mind which manifested itself in those fatal days of March, 1917. We are not yet sufficiently removed in time from these events to be able to see them in their true historical perspective. Besides, some degree of subjectivity in the evaluation of one or another of these causes can hardly be avoided. Nevertheless, the author will try to expound his argument so as to enable the reader to form his own opinion of the meaning and the fundamental causes of the outrages committed by Russian crews in the course of the first few weeks of the "bloodless revolution," and to arrive at his own conclusions with a more or less complete knowledge of facts, even if these conclusions will differ from those of the author, who has no axe to grind and is only anxious to discover the truth.

*First Category.* On board ship, in all navies, officers and men are cooped up in the comparatively narrow spaces between the decks. The seamen have every day the opportunity of observing that the officers are placed in far better material conditions than the enlisted men. Better food, comfortable cabins, the possibility of going on shore in civil dress, etc., all this rouses a feeling of envy among the less favorably placed men. Even insignificant offences are severely punished by the naval regulations. Things that would have remained unpunished on shore, afloat may lead to imprisonment or limitation of shore-leave. The punished man, even if deservedly punished, thinks that he is suffering by the fault of the lieutenant of the watch, or any other officer who happened to notice his offence, and by that of the captain or of the court martial (consisting also of officers) by whom the punishment was awarded. Thus a certain number of seamen, especially

those whose conduct is not beyond reproach, acquire the habit of contrasting in their minds the officers to the men, as oppressors and oppressed.

As it is impossible to avoid on board ship a constant intercourse between both parties, the recollection of a punishment awarded by the initiative of such and such an officer becomes effaced from the mind of the punished with much more difficulty than in other conditions. Again, officers are recruited among the sons of comparatively well-to-do families of the upper and middle classes, whereas the men are, for the most part, sons of factory workmen or of the poorer rural classes, except those who come from families of fishermen or sailors of the commercial fleet. In our days of class hatred, young men entering the navy often bring from their homes a developed class-consciousness and hatred of the bourgeois, and are prepared to regard the officers as the agents of a hated class. This is especially the case in those navies where recruiting is by conscription, as, for example, in the Russian and German navies, and only in a much smaller degree in those where enlistment is voluntary, as in the navies of the United States and Great Britain.

The material conditions of human existence on board ship are very different from those on shore. The men are heaped together in common dormitories between the decks. They have no privacy. They have no corner they can call their own. They pass the whole day under the eyes of hundreds of other men, and at night they sleep in hammocks. The crews of warships generally receive food which is rich in nitrogenic substances, and at the same time they are often unable to have sufficient exercise. Abundant nourishment with little exercise makes for neurasthenia and general unbalancement of the mind. These causes are especially powerful over those seamen whose specialty demands no expense of physical activity, such as wireless telegraphists, electricians, clerks, etc. Life on board ship is under the constant influence of electric fields. Cats, on some ships, cannot hold out for more than a few weeks: man is less sensitive to the action of electricity, but still its effect must be reckoned with. On board great modern battleships, protected by several belts of armor, part of the crew has to live in spaces never entered by the light of day and where air is introduced by pressure ventilators.

At last, the men have little hope ever to obtain a commission, although in most navies (including the Russian pre-revolutionary navy) this was in theory possible.

All these conditions exist in all navies, but naturally their importance varies according to differences of race, education, organization of service, discipline, food, climate, and to the degree of comfort in which the crews are placed. They are, however, inherent to every navy and contribute to make seamen dissatisfied and unbalanced, especially on long passages or when conditions are such as not to permit frequent shore-leave.

*Second\* Category.* Before the war the Russian navy was traversing a period of transition in the organization of ship service and in the training of recruits, a period that began soon after the Japanese war. Most of the innovations were being introduced on the initiative of a group of energetic and comparatively young officers who had taken part in the Japanese war. Admiral N. O. Essen was at the head of the movement. Owing to their efforts, discipline, which had been greatly undermined in the years immediately following the Peace of Portsmouth, had not only recovered, but now attained a standard hitherto unknown in the Russian navy. Unhappily, the sound principles that were being inculcated by these officers had not yet found their way into the naval regulations, and this somewhat unsystematic collection of rules relating to ship-service had not yet been replaced by a new regulation, better answering to modern exigencies. Consequently, most war ships regulated their service on board by various instructions and rules drawn up by their respective captains and commanders. The spirit of such instructions was the same in all the navy, but there was no absolute uniformity, and this favored the impression that the regulations was one thing and service on a modern warship quite another thing, and that the two had little in common. This could not fail to undermine all respect of the regulations, among the younger officers as well as among the more intelligent and forward seamen.

Besides, the "regulations on discipline and punishments for the breach thereof" in force in the Russian navy were decidedly out of date, and were based on wrong principles. Thus, on a Russian warship, every officer had the right to award summary punishment to every man of the crew. The degree of punishment alone

depended on the rank of the officer. This was conducive of inequality in punishments on board the same ship for the same offence, and the men became accustomed to consider the officers' actions as arbitrary. It is, moreover, to be regretted that the captains of some ships delegated their power of awarding punishments to the commander, sometimes even to section commanding officers. Attempts to regulate this anomalous state of affairs were made on the best disciplined ship (e. g., on the cruiser *Bogatyr*) and took the form of an unofficial modification of the statutory order of awarding punishment, so as to concentrate all the power of awarding summary punishment with the captain, or the commander. The other officers had only the right to establish the fact of an offence and to enter it in the punishment record, but could not themselves award any punishment. Besides, as on board some ships officers remained for fairly long periods of time (six or seven years sometimes) different conditions of service and discipline were gradually developed on different ships. Some ships were very "severe," others were "slack." This was favored by the tendency of the captains to introduce individual features on board the ships they commanded, a tendency strengthened by the superannuated character of the naval regulations and of the regulations on discipline.

All this lack of system in awarding punishment (some of which were rightly felt as degrading, e. g., standing on the quarter deck—others as unnecessarily cruel, e. g., the reiterated forfeiture of shore-leave during a month), tended to irritate the crews, who came to regard the officers as petty tyrants, who punished according to their moods or their personal ideas on discipline, not according to a law common to all the navy. The comparatively infrequent cases of blows being inflicted by officers (this was strictly condemned by the regulations) always became known to all the crews of a squadron and were magnified by rumor.

The crews of the Russian navy were recruited *by conscription* from the working and peasant classes. The term of service was long—five years; in the infantry it was only three years. The number of re-engaged non-commissioned officers was not sufficient, and they were not always the best element from a moral standpoint. Many of the re-engaged were men who lacked initia-

tive and ability, and did not hope to make their way through life on shore. The re-engaged non-commissioned officers had little authority with the men.

The men entered by conscription were of various descriptions. The recruits differed one from another in their social standing as well as in their intellectual development. Some of them were semi-educated young men of the working class, who had read many books and had ideas on Karl Marx and his theory, others were illiterate peasant boys from the backwoods of Archangel who had never seen a brick house or a railway engine, who had not even suspected the existence of such a thing as the Russian navy, and of course could not understand what it was wanted for. This heterogeneous mass of recruits was incompletely hammered together in the course of a six-months' drill on shore by very primitive methods, which were not out of place only in regard to their least civilized elements. The better educated young men left the depot with the one conviction that all this drilling had been aimless and meaningless.

As a class of commercial sailors as it exists, e. g., in France and England, is practically non-existent in Russia—the great majority of recruits, when once on board, found themselves in completely alien and unfamiliar surroundings. A current Russian phrase about a recruit was that he had been “taken from the plough,” i. e., had never seen the sea and was quite a stranger to it. The seamen never felt themselves at home at sea, and only dreamt of returning as soon as possible to their villages.

The officers of the Russian navy were, up to the very last years before the war, taken exclusively from the class of hereditary nobles. Even after this rule was abrogated, although young men of non-noble families were admitted to the Naval Academy, they remained an infinitesimal minority. The Russian peasant was accustomed to think of all nobles as squires, and the ill-feeling he might have developed toward the landlord at home he extended to the officers on board, although the majority of naval officers possessed no land, belonging to families who had served in the navy for generation after generation, poor for the most part, and existing exclusively on their pay.

On most ships the men might receive shore-leave only on Sunday afternoons, for a few hours only, and in rotation, so that only

a quarter of the crew were allowed shore-leave at a time, and a seaman came on shore only on an average of once a month for a few hours. This was obviously insufficient, and in the course of the war shore-leave came to be given every day as far as conditions permitted. But until the very outbreak of the revolution, shore-leave was accompanied with difficulties and useless formalities.

On shore seamen were forbidden to smoke in the streets and public places, to enter restaurants and public houses, to go to theaters, except they sat in the gallery. They were also forbidden the entrance of divers public gardens and boulevards (e. g., in Sevastopol) and this could not fail to irritate their sense of dignity.

During the war this feeling of offended dignity was strengthened by the fact that in the army, where the loss in officers was immense, every half-educated soldier could hope to receive a commission after a short term of training in the School of Ensigns—and at the same time non-commissioned officers of the navy, who were perfectly qualified technicians, remained simple men and were obliged to salute their more successful comrades who served in the army; they saw that these had now the same privileges as officers of noble birth while they themselves had no hope of promotion.

The mobilization at the outbreak of the war brought back reservists who had served from 1904 to 1907, men who remembered the old days of loose discipline and were quite unprepared to serve under the new and severer order which had been established by 1914. They were naturally much annoyed by the new conditions, and did not readily submit to discipline. At the outbreak of the war I was commanding a section on board the cruiser *Russia*. Before the arrival of the reservists the average of summary punishments seldom surpassed three or four per month, with 180 men in the section. After the entry of sixty reservists the number of punishments immediately rose to twenty-five or thirty monthly.

It is, at last, important to remember that the officers of the Russian navy, like all the Russian educated classes, were separated from the people and did not understand their mentality, though perhaps the naval officers stood nearer the man of the

people and understood him better than any other class of *intelligentsia*.

After all this enumeration of the peculiarities of Russian naval life the reader will be, perhaps, at a loss to understand how it was that the Russian navy, and especially the Baltic fleet, showed such efficiency and such fitness to win. This may be explained only by the superior moral and intellectual qualities of the individual officers who worked with complete self-abnegation, Admiral N. O. Essen at their head. They succeeded in obtaining good results, not owing to the surrounding conditions, but in spite of them. Numerous foreign missions (including the American naval mission under Rear Admiral Glennon, U. S. N.), were able to see with their own eyes that since the Japanese war the Russian navy had changed for the better so as to be almost unrecognizable; it was only the revolution that greatly lowered its fighting qualities (Oesel operation, 1917).

*Third Category.* The Russian navy early became a favorite field of revolutionary propaganda. The guards' naval division was among the most active participators in the Dekabrist rebellion of 1825. A number of pupils of the Naval Academy also took an active part in it, and in consequence Emperor Nicholas I deprived the academy of the appellation of "Emperor's Own," which it had hitherto shared with the *Corps des Pages*.

In the second half of the nineteenth century the *Narodnaya Volya* (People's Will) party tried their best to spread their ideas among the officers of the navy and the cadets of the Naval Academy. An association was formed to this end, under the name of Whalers' Society, which tried to attract young men ostensibly for the purpose of forwarding Russia's sea fisheries. Of the revolutionary officers of the navy the greatest notoriety was acquired by Lieutenant Sukhanov, who was subsequently sentenced to death.

In the revolution of 1905, Lieutenant Schmitt, the figurehead of the seamen's rebellion in Sevastopol, and Lieutenant Nikitenko, a member of the terrorist section of the Social Revolutionary party, died by the hand of the executioner. In 1917 Midshipman Ilyn (Raskolnikov) and Ensign Garfield, both members of the Communist party, played a prominent part in the revolution. Be-



sides these, several naval officers were members of the Social Revolutionary and Social Democrat parties.

But all these instances are not typical of the Russian naval officers' milieu. The overwhelming majority were not at all interested in politics and regarded the revolutionary outbursts in the navy as mere mutinies. Only a small minority were actively reactionary.

But in the last few months of 1916 a change came over the attitude of the naval officers. The murder of Rasputin, the speeches of Purishkevich and Molyukov, compelled most of them to start thinking on the political situation in Russia, and undermined their former conviction that autocracy was the form of government which answered to the cultural and economical level of the Russian people. But from this change of attitude to active sympathy with the revolution the distance was great. A parliamentary monarchy was, to the majority, the extreme limit of aspirations and probabilities.

But among the seamen revolutionary propaganda had been far more successful. The Social Revolutionary party was especially popular, sparing, as it did, no effort to create revolutionary associations on the warships. The Bolshevik party had also their organizations in the navy, but they were far less numerous and influential than those of the Social Revolutionary party.

Ever since 1905 a series of mutinies and rebellions had taken place in the navy; they were purely revolutionary in character, although sometimes, for motives of expediency, their leaders gave them the shape of economical dissatisfaction (dissatisfaction with food, pay, etc.). The best known are: the bloody mutiny of the battleship *Prince Potemkin*, the Sevastopol rebellion headed by Lieutenant Schmitt, the mutiny on board the cruiser *Pamiat Azova* in 1906, and the seamen's rebellion in Kronstadt in 1905. Besides these, some disorders would break out nearly every year in the Baltic as well as in the Black Sea fleet, and several ships became notorious for their revolutionary proclivities, while others remained staunchly loyal. The torpedo boats and in general the smaller craft were loyal, while the battleships, especially the new ones, were inclined to mutiny.

The putting down of all these rebellions involved the execution of ringleaders, and the revolutionaries were not slow to spread

rumors of executions en masse and of wholesale annihilations of rebellious crews. These rumors had no foundation whatever. The government applied capital punishment only to the leaders and to men guilty of murder. The total number of men executed is nearer a few dozens than many thousands, as it was asserted by the propagandists. In some cases (e.g., the mutiny on the battleship *Emperor Paul I*) the Emperor substituted penal servitude for capital punishment to all the men sentenced by the court martial. In the years immediately preceding the war, the government succeeded in expelling the revolutionary associations from the ships, and by the autumn of 1914 only wretched remains of the terroristic and fighting associations of the Social Revolutionary party were left here and there.

The upheaval of patriotic feeling which accompanied the outbreak of the great war contributed to the establishment of an informal armistice between the government and the revolutionary parties. During the first two and one-half years of the war, there were only two cases of disorder in the navy. The first took place on board the cruiser *Rossia* in the summer of 1915 and only proved the weakness of the revolutionaries who were backed only by the reservists. The second was on board the battleship *Gangut* whose captain was Captain M. Kedrov, an officer of outstanding merit, while the commander was another excellent officer—Commander M. Petrov. This outburst was more serious than the preceding one, but it also ended without bloodshed, owing to the energetic measures taken by the senior officers and the obvious lack of sympathy with the rebels of the majority of the men. But in 1917 the men had become weary of the war; especially those whose term of service should have ended in 1914, and who were now eight years away from their homes and families.

The German general staff was interested in the weakening of the Russian Baltic fleet and spared no efforts to foster the discontent of the men on board. Their opportunities were especially favorable in Helsingfors where not only the sympathies of the Finnish bourgeoisie were on their side, but where German agents could find active help from the Finnish groups who were trying to liberate their country from Russian domination and saw in Germany a powerful ally in their struggle for independence. This

explains the formation of Finnish volunteer *Jagär-battalions* who fought on the German side.

No documents have as yet been published in Germany that might throw light on the activity of the agents of the German general staff in Finland and Kronstadt, but there is no doubt that large sums were expended and that an active propaganda was carried on among the sailors.

The crews and the shore units stationed at Kronstadt owing to their composition (large percentage of reservists of old terms, and, in the naval divisions, a considerable number of seamen taken off their ships for bad conduct), as well as to the proximity of Petrograd with its hundreds of thousands of factory workmen, were under the action of Bolshevik propaganda, more than any other part of the navy. The influence of Bolshevism over the minds of the Petrograd workmen was on the increase since the beginning of the war. The Bolsheviks had a strong organization in Kronstadt and it was popular with the seamen.

In combating the revolutionary movement in the navy the government had, previously to the war, arrived at the idea that much would be gained by handing over the whole proposition to the political secret police and the gendarmes' corps. Secret agents were introduced on board and in the barracks and started their secret work, acting independently of the commanding officers and obeying only the orders of their own superiors. Unhappily the agents of the Russian home office were prone to recur to methods known by the name "provocation" and used to support one revolutionary party against another. The Bolsheviks enjoyed their special protection and, consequently, relative immunity. In the winter of 1916-1917 the revolutionaries developed an intense activity among the workmen of Petrograd, preparing an armed insurrection. This activity found an immediate echo in Kronstadt where the revolutionary spirit rapidly grew. Admiral Viren, the commandant of Kronstadt, was known to be a man of strong will and unbending loyalty to the sovereign. The remains of the social revolutionary associations on the ships stationed at Helsingfors (especially the battleships *Paul I* and *Andrey Pervozvanny*) also began to stir.

Thus by the end of February, 1917, the attitude of the officers of the navy may be qualified as moderately conservative, with a

shade of grumbling against a weak and inefficient government. The more advanced proletarian elements of the men were strongly revolutionary. The contrast between the two attitudes was especially sharp in Kronstadt, which was ruled by the heavy hand of Admiral Viren, and in Helsingfors, where Admiral Nepenin was also not of very soft disposition and was considered a reactionary.

In the Black Sea fleet, remote as it was from the centers of German propaganda as well as from the centers of industry, the men were far more quiet, and the commander-in-chief, Vice-Admiral Kolchak, was known to be a man of moderately liberal views. The contrast which existed in the Baltic fleet between the political ideas of the commanding officers and those of the more advanced men, was there absent.

The revolt in Kronstadt broke out almost simultaneously with that of the guards' depot in Petrograd. Its first victims were Admiral Viren and Rear Admiral Alexander Butakov. Viren's corpse was soaked in petrol and burned on the Anchor Square. The revolution took its revenge on autocracy in the person of the commandant of Kronstadt and the scum of the seamen's mob triumphed their victory over the stern commander who had upheld a discipline of iron in his command. The other senior officers were all massacred and together with them a few more or less casual victims from among the junior officers. The massacre was carried out according to a list drawn up beforehand, and was not the outcome of personal vengeance on the part of individual seamen. The Bolsheviks from the very beginning succeeded in establishing their authority and until the October revolution made them rulers of all Russia, Kronstadt was their stronghold and their sanctuary, where the agents of the impotent provisional government were afraid of pursuing them.

The Kronstadt massacres were a phase in the process of throwing down the old régime, and from the revolutionary point of view they had a political *raison d'être*, destroying as they did, opponents with whom no compromise was thought possible. The events in Helsingfors were of a totally different nature. Here the revolutionary associations were much weaker, and the moods of Petrograd were much less rapidly and strongly reflected in the minds of the seamen than was the case in Kronstadt. The com-

mander-in-chief, Admiral Nepenin, easily realized that the revolutionaries were going to have the upper hand of the old government. In order to preserve his fleet for the struggle against Germany, he decided to take the initiative of transferring it to the allegiance of the new revolutionary government and he was backed in his purpose by the council of flag officers and captains. A message was wired to Petrograd containing the recognition by the Baltic fleet of the provisional government that had been formed by the Duma. For several days after this no disorder occurred, except for a few comparatively insignificant breaches of discipline, and the keen interest displayed by the men for what was going on in Petrograd. It seemed reasonable to hope that the revolution in Helsingfors would take a peaceful course and would not be sullied with bloodshed. The facts, however, proved quite different. It must be remembered that from the start a rivalry arose between the Petrograd soviet of workmen's delegates and the provisional government, which manifested itself best of all in the soviet's tendency to assure their control over the Petrograd garrison. This rivalry found an echo in Helsingfors.

The officers were not fully aware of what was going on in Petrograd. They had a vague idea that all the revolutionaries and all those who had identified themselves with the revolution were united into one common front. Of the divergence between the socialists, whose stronghold was the Petrograd soviet, and the provisional government, who represented the liberal parties of the Duma, they had no suspicion.

Meanwhile, since the outbreak of the revolution, the old social revolutionary associations on board the ships of the Helsingfors squadron were beginning to awake from their torpor and had started an active propaganda among the crews, displaying the greatest energy on the battleships *Emperor Paul I* and *Andrey Pervozvanny* and *Slava*. The members of these fighting associations, bred as they were on the idea that the officers of the navy were the most trustworthy bulwark of black reaction, could not understand Nepenin's motives in recognizing the revolutionary government and did not believe in his sincerity. They suspected that this recognition was only a tactical move to gain time and prepare a counter-revolution. The behavior of Nepenin, whom they knew to be a man of strong will, sharp and stern, was a

puzzle to them. These active revolutionaries had always imagined that in case of a revolution, the navy could be gained only by putting down the armed resistance of the officers who had been always loyal to the old government, and many of whom had sacrificed their lives in suppressing mutinies. The peaceful accession of the officers, with the commander-in-chief at their head, to the cause of revolution was incredible and incomprehensible. As most of these revolutionaries were semi-educated men with strong voluntary impulses but without any broad intellectual outlook they had not been able to note the change which came over the officers in connection with the Rasputin affair, with the speeches of even conservative members of the Duma against the government, and with the general state of Russian public opinion in the beginning of 1917. They thought the officers were the same staunch supporters of autocracy as they had been in pre-war times, and expected to meet with their traditional resistance.

Now that the revolution had taken place so peacefully in Helsingfors, the fighting associations found themselves without an enemy to fight. The mine had been prepared for explosion but there was nothing to explode—the enemy had dismantled their own walls. But the destructive tendency of the fighting associations was so powerful that, as the central soviet of Petrograd made no attempt of explaining to the local bodies that they had no more work to do—the inertia of revolution had its way. The signal was given and the blood of numerous victims was shed.

It is certain that German agents who carried on relations with the Russian revolutionary parties (I am affirming this, not of the principal leaders, but of the secondary local agents) did what they could to prevent the peaceful transmission of power to the new government. They sowed mistrust of the officers among the seamen, playing on feelings originating in causes of the second category, i. e., in the shortcomings of the Russian naval organization that were resented by the seamen.

The first outburst took place on the battleship *Andrey Perovzanny*. The signalman of the watch made an attempt to light a red light on the fore mast as a signal for the men to rise against the officers, but was shot dead by the officer of the watch, Lieutenant Bubnov. This led to an armed encounter between

the officers and the crew of the battleship in the course of which were killed Rear Admiral Nebolsin, Lieutenant Bubnov and several others. The mutiny immediately spread to the ships stationed in the neighborhood, and on the *Emperor Paul I* several officers were also killed. On the battleships of the first brigade (four dreadnoughts) there was no bloodshed, the crews only demanded of the officers the surrender of their arms. Admiral Bakhirev ordered the officers to deposit their revolvers in his cabin, but refused to hand them over to the crew.

A group of men from the *Andrey Pervozvanny* and the *Paul I* went on board the torpedo boats which were stationed in the port and killed several officers of the torpedo division while the crews of the torpedo-boats assisted passively at the massacre.

But on the brigade of new oil-burning torpedo boats (of the *Novik* class) the crews opposed the rebels and refused to deliver their officers, among whom was the commanding officer, torpedo division, Rear Admiral Kedrov.

The commander-in-chief, Admiral Nepenin, had his flag on the unarmed yacht *Krechet* whose crew remained calm and were only afraid of the mutinied battleships opening fire on the defenceless flagship. Nepenin wired to the provisional government reporting the turn events were taking in his fleet and candidly avowing that he considered them as fatal to the fighting efficiency of the fleet. This message became known to the seamen and was used by the leaders of the revolutionary associations as a material for their agitation against the admiral. By this time a soviet of seamen's, soldiers' and workmen's delegates had sprung up in Helsingfors, and Ensign Garfield, a member, as I have said, of the Bolshevik party, was beginning to play a leading part in it. A mob of seamen, mostly from the *Andrey Pervozvanny* and the *Paul I* crossed the ice to where the *Krechet* was stationed and their armed delegates, coming on board, announced to Nepenin that by the will of the revolutionary navy he was under arrest.

On their way from the flagship to the city the seamen informed the admiral that he was sentenced to death and that the sentence would be carried out immediately. Nepenin remained perfectly calm, took out his cigarette case, lit a cigarette, and gave himself the order to fire. Such was the end of the admiral who was the first of naval commanders to recognize the revolutionary govern-

ment. He was put to death by an irresponsible secret association of terrorists and no party ever had the courage to assume the responsibility for this senseless murder. The fate of Nepenin was similar to that of the d' Albert de Rion, senior naval officer at Toulon in 1789. The national assembly made, on that occasion, the following statement: "Acknowledging as justifiable the motives that guided M. d' Albert de Rion and the other officers of the navy, as well as those that guided the members of the municipality and the national guards who took part in this affair, the national assembly declares that there is no ground to blame anyone." (*Moniteur*, January 1st, 1790.) The national assembly, however, showed more energy than did the provisional government who did not even have the courage to order an official investigation of the Helsingfors events, sanctioning thus the right of seamen to massacre their officers whenever they thought fit.

In several cases the murders were accompanied with tortures and mockery, as, for example, Lieutenant Lange had his fingers cut off. The bodies of the murdered officers were brought to the dispensary of one of the hospitals, but even there they were not left in peace by their torturers. The bodies were propped up along the walls in the pose of saluting, and Admiral Nepenin in the middle of the room with a cigarette thrust in between his teeth, "The commander-in-chief and his staff," the murderers explained to the other men.

Like in Kronstadt the Helsingfors massacres were carried out according to a list previously drawn up. Several officers who were on the list escaped their fate by happening to be on shore and the murderers' not being able to find them. Admiral Kedrov was preserved from Nepenin's fate by mere chance, owing to the fact that he had been summoned to Petrograd by the provisional government who had appointed him under-secretary to Guchkov, the war and naval minister.

Horrible scenes were witnessed in the dispensary—where the widows of the massacred officers were rudely and cynically mocked at by the murderers.

It is important to retain that the massacres were carried out by a very small group of seamen for the most part from the *Andrey Pervozvanny* and the *Paul I*. The majority of seamen were only passive spectators and sometimes even opposed the



murderers (e.g., the crews of the oil-burning torpedo boats and of the first brigade of battleships). There were several cases of young seamen going mad after witnessing the horrors of this St. Bartholomew's night.

Nepenin was replaced in the command of the Baltic fleet by Vice-Admiral Maximov, a man of unlimited ambition but with no strong sense of honor, and not very intelligent. He was elected by the seamen and confirmed by the provisional government. With the appointment of this "Red" Admiral, as he was called by the too-officious Petrograd press, began a period of agony for the Russian navy in the Baltic.

We have enumerated the causes that led to these massacres; we will now try to investigate their relative importance in the tragic events of Kronstadt and Helsingfors.

As to the causes of the first two categories they were materially the same in Kronstadt and Helsingfors, as in Reval and in the Gulf of Riga (where the battleship *Tsesarevich* belonging to the same brigade as the *Andrey Pervozvanny* and the *Paul I* was passing the winter). In the Black Sea things were even somewhat more complicated, as Vice-Admiral Kolchak and the officers who came with him (headed by Captain M. Smirnov) had begun in 1916 to introduce the order which existed in the Baltic fleet and the revolution found the Black Sea fleet in a period of transition. Nevertheless, in Reval and in the Gulf of Riga the critical period passed comparatively calmly; there were no cases of naval officers murdered, though several army officers were killed by the soldiers in regiments stationed near Reval. In the Black Sea the transmission of power to the new government was not only peaceful, but was accompanied by the formal expression of complete confidence in their officers on the part of the men. Collisions between the officers and the men began here much later and chiefly under the influence of strangers—propagandists arriving from Kronstadt and Helsingfors. This confrontation of facts proves that the conditions of naval life at Russia were not in themselves sufficient to bring about the massacres which took place in March, 1917.

Consequently, though we do not deny that the shortcomings of discipline and organization existent in the Russian navy had their

part in breeding those unfavorable relations between the officers and the men, and thus preparing favorable conditions for revolutionary propaganda, we must recognize that this propaganda, and, to a certain degree, the agents of the German intelligence service, must be held responsible for the blood of so many of the best Russian sailors, shed in Kronstadt and Helsingfors. In Kronstadt, where the influence of the Bolshevik party was from the very beginning predominant, the events were so consequent that hardly any doubt is possible, especially if we remember the methods later adopted by that party, viz., the extraordinary commission for combating counter-revolution, speculation and sabotage, better known by the name of *Chrezvychayka* or *Cheka*. The Bolsheviks drew up a list in which they included all the more energetic and active officers whom they believed incapable of compromise and methodically destroyed them, profiting by the favorable moment. Every mob is cruel, but a revolutionary mob, which is not yet sure of its ultimate triumph, is doubly so. It was not very difficult for the Bolsheviks to direct these bloodthirsty instincts in the direction they wanted. The seamen of Kronstadt did for them the work which in later days was done by the *Cheka*—they decapitated the *intelligentsia* and the bourgeoisie by destroying all their more noble and staunch elements.

The conditions in Helsingfors were different. The revolution had already attained its first objective—the recognition of the provisional government—without the aid of the seamen, by the decision of Admiral Nepenin and the council of flag officers and captains. But the revolutionary fighting associations who had lost the moment for effective action desired to expend their reserves of energy on the head of the “Turk at the Fair” and this part fell to the officers. On the other hand the German general staff was dissatisfied by the peaceful course of events in the strongest squadron of the Baltic. The combined action of these two agents brought about the mutiny of two battleships while the rest remained passive spectators. It is characteristic that the time when on three or four battleships of the second brigade the officers were being massacred, on the fourth (the *Tsesarevich*) stationed in the Gulf of Riga and isolated from external influences, the crisis passed more or less peacefully, in spite of the fact that there relations between officers and men had always been

rather bad. The same may be said of the torpedo division. On the coal-burning torpedo boats stationed at Reval the critical days passed without any disagreeable incident and complete order was preserved, while the fifth flotilla stationed at Helsingfors was completely disorganized by the murder of most of the commanding officers and the senior officers.

The Black Sea fleet which in 1905 had been the scene of bloody outbreaks traversed the critical period quite peacefully, owing to the fact that it was isolated from the influence of revolutionary propaganda from Petrograd, as well as from the activity of German agents. All this has brought us to the conclusion that causes of the first two categories played a comparatively unimportant part in the genesis of the massacres of March, 1917, in the Baltic fleet, and that causes of the third category were the most weighty. The officers of the Baltic fleet were not the victims of a long-suppressed wrath of the seamen oppressed and offended in their human dignity, but the objects of the terrorist activity of secret organizations who regarded them as dangerous to the revolution.

Turning to the historical parallels we see that in the great revolution the officers of the French navy suffered almost exclusively from the persecution of political extremists to whom they were members of the hated aristocracy. Grimoir, Kersaint, and d'Estaing perished, not by the hand of mutinous seamen, but under the knife of the guillotine.

The mutinies of crews of the British navy in the last years of the eighteenth century present a different picture. We may find here, it is true, some traces of political propaganda—the United Irishmen and other Irish revolutionary groups on the one hand, the agents of the French government on the other, took an active part in these mutinies. But their true causes lay in conditions which we have discussed under the first two headings. The mutiny of the crew of the *Hermione* which led to the death of all her officers, including quite young midshipmen, had no political basis. The cruelty of Captain Piggott and the imperfection of British naval organization in the pre-Jervis period incited the seamen to mutiny. The petitions drawn up by the seamen's delegates at Spithead and on board H. M. S. *Sandwich* in Nore clearly show that exceedingly hard material conditions and oppression were the only causes of the seamen's unrest. We hear,

it is true, of the sloop *Shark's* going over to the enemy, but on such a small vessel the presence of a few revolutionary Irishmen or of several educated men press-ganged under the *ad captandum vulgus* act might have been decisive.

Thus we see that the seamen's mutinies which accompanied the revolution in Petrograd occupy an intermediate place between what happened in the French navy under the revolution and the mutinies of the British seamen. In France naval discipline was destroyed exclusively by external political influences, whereas in England the mutinies were the outcome of impossible conditions of service.

To conclude, the author cannot refrain from mentioning a characteristic incident which took place on board the torpedo boat he was commanding, nearly simultaneously with the Helsingfors massacres.

When Nepenin's telegram announcing that he had gone over to the Duma was received in Reval, the division commander assembled all the commanding officers of the torpedo division to discuss the situation. It was decided to follow the example of the commander-in-chief and to announce this decision to the crews. On returning on board his boat the author ordered a parade on the quarter deck. After briefly relating what had happened in Petrograd the author announced the decision of Admiral Nepenin and the council of senior officers. As the speech was received with reserve and the men expressed neither joy nor regret at what had happened, he addressed the men nearest him and asked them what they thought of the revolution. He was much astonished by their answer, "The same as you, your honor." And this was going on only a few dozen miles away and only twenty-four hours before the mutiny of the *Andrey Pervozvanny* and when blood had already flowed at Kronstadt.

The explanation is that at Reval the seamen were left to themselves. They were beyond influence of revolutionary organizations, nor were the German agents so active as in Finland, where they had made themselves a cozy nest.

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## SOME MUTUAL RELATIONS OF GUNNERY AND TACTICS

BY CAPTAIN RALPH EARLE, U. S. NAVY

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"Damn the torpedoes," said Farragut, "Four bells, Captain Drayton, go ahead! Jouett, full speed!"—Mobile Bay, 5 August, 1864.

"Keep nearer to the enemy."—Beatty at Dogger Bank, 24 January, 1915.

The world war witnessed the development of new types of sea warfare such as the tactics of destroyers against submarines, of submarines against other submarines, as well as the beginnings of those to be employed by aircraft against both submarines and surface vessels, those utilizing smoke screens, noxious gases, sea-plane carriers and torpedo planes. The newness of many of these weapons was such as to preclude their possibilities being given a real test and there have resulted many claims as to the potential power of each new weapon, some of which are conceded generally to be reasonable while others are conceded extravagant. Be that as it may, naval warfare is an extremely complicated profession and the old sailor's worries were few when compared with those of the modern seaman. The latter's greatest reliance must still be placed upon his own prompt offensive against each new instrument of destruction. Every offensive weapon produced is soon matched, if not actually excelled, by the defense adopted against it.

The extensive use of mines and depth charges against vessels operating both on and beneath water formed perhaps one of the most important types of warfare developed during the war. The recent experimental use of the aircraft bomb against old vessels has indicated that it too is most efficient when used as a depth charge.

Gunnery broadens its scope to meet the new conditions and must provide the means to defeat the attack of air forces, deadly gases, and whatever else the future may bring. The motive of the tactics that such gunnery most efficiently can utilize is well expressed in the words of the two great seamen quoted at the head of this article. The submarine was downed by the newly developed gunnery and tactics of the destroyer, and a similar fate is the portion of the forces of the air and of those using gases.

A few of the relations of gunnery and tactics will be touched upon with the hope that any means not now existent to defeat the new weapons may be studied and brought to perfection. To accomplish the great results desired the peace-time navy suffers from the lack of a proper allowance of personnel in its bureaus at the shore stations. The number of officers so assigned is generally only sufficient to carry on the routine of administration, none are available to intensively study and digest the mass of information acquired in war, while such is yet fresh in their minds. Any slowness of new developments in the navy is due principally to this insufficiency of officer personnel in the bureaus, the only places where the information is accessible. To reason out the lessons of the war, to develop the new devices indicated, while at the same time perfecting the old stand-bys is a task that requires the undivided attention of experienced professional men.

Naval gunnery is the art and science of firing guns, torpedoes, bombs, and other weapons in the best manner to effect the greatest possible damage to the target. Tactics similarly is the art of maneuvering a battle fleet before and during action against any enemy in the manner best adapted to ensure success; and it, therefore, requires superiority over the enemy in any or all of several factors; such as numbers, types, guns, speed, protection, use of radio and aircraft skill, experience, morale and doctrine. Tactical maneuvers include all that proximity to the enemy dictates as being the proper disposition of fleet or vessels to meet the conditions of the battle then imminent.

Beyond a doubt the relation of tactics to gunnery is so close that in order to obtain the desired final result—i.e., decisive victory in battle—instead of being dependent one upon the other, they merge and unite to form the one essential attribute that must

be possessed by the victor at sea to a greater degree than is the case with his opponent.

Skill in both tactics and gunnery must be developed to the highest degree attainable, and a deficiency in either cannot be allowed to hamper the free use of the other in battle. Our naval commanders must be free to maneuver at any time secure in the fact that thereby they are not lessening the effectiveness of their gunfire. If this be not now the case a direction for study is surely indicated.

The tactical portion of gunnery is the method employed by the various war craft in getting the maximum destructive effect out of guns, torpedoes, bombs, depth charges, and other naval weapons.

Some maneuvers that affect gunnery are those that place the fleet or ship in an advantageous position as regards to sun—better spoken of as the light gauge—wind, rain, and the methods employed when in gun or torpedo range to get the maximum destructive results of the gun and torpedo. At the same time fleet or ships must maneuver to decrease their liability to injury from the fire of the enemy.

Instruments for keeping the range of the target must be of such a character as to make the problem of hitting so simple that battle gunnery will be similar to that of a stationary vessel firing at a stationary target.

In order to derive the greatest effect from the armament, those tactics must be employed that will place the ship in the most advantageous position with regard to the enemy and take full advantage of all tactical considerations and compel him to expose the largest target while depriving him of the use of a portion of his battery. In order to succeed vessels must utilize their speed to compel the enemy to maneuver disadvantageously, to meet his maneuvers, and to make the range such that any advantages one possesses, armor, protection, or gun power may be utilized to the utmost.

The gunnery experience of the battle of Jutland indicated that a very searching inquiry into the methods of shooting might result in much betterment. In order to avoid torpedoes, of which seamen rightly stand in awe, both sides maneuvered constantly and no fire control then existing was able to make gunnery as

good as if no maneuvering had been necessary. Can any fire control be devised to accomplish this?

If gunnery is of a grade such that it compels a steady course to be steered, then a ship will be compelled to fight on a course parallel to or converging upon the enemy, a condition only possible providing that the enemy is similarly handicapped. Notwithstanding the difficulties of keeping the range it is evident that maneuvering must be frequent in battle, and to win the decision our sights that direct the fire must be kept set constantly to the range and deflection necessary to ensure hitting the target, though both these factors may be changing continually. In other words, a commander-in-chief engaging an enemy must be able to use his ships at any speed from their highest to lowest with a completely free choice of courses, such choice being uninfluenced by any fear that the efficiency of his armament will be affected more by one maneuver than by another. Torpedoes, mines, aircraft bombs and submarine forces can be avoided in a large measure by maneuvering while still using the heavy guns.

Thus a survey of the subject confirms the fact that gunnery and tactics are so intimately related that they evidently must work in harmony, and give all an ideal to be striven for in the necessity of so providing means of control that the use of either is absolutely unrestricted by the other; and, upon investigation, it will be found that, if, by the application of modern science, such may be now the fact, nevertheless they have hampered each other in the past. Gunnery has always suffered when it has been found necessary to maneuver. This condition must be eradicated if we are to be truly efficient.

Tactics of the sailing ship and the auxiliary steamer were closely allied and, from the Texel, in 1665, when column of battle was first formed, through the Nelsonian era when close action was still the rule—although the long column had given way to several columns directed at logical points in the enemy's lines—down to the use of the ram which appeared at the same period as armor, they consisted in short-range fighting and followed the conventional principles. The ram as a weapon had its one great day at the battle of Lissa, July 20, 1866, being soon eliminated by the introduction of high-powered guns, long-range torpedoes, and the submarine.



The object of tactics, however, is still the same as when propounded by its first real master, Nelson, namely: that the only purpose of the battle is to secure a complete victory, and that only the offensive will accomplish this objective. Togo was a modern exponent of Nelson tactics which caution boldness as he, under gunfire, maneuvered so as to employ all his force while preventing the enemy from doing so, even though his own fire was reduced thereby for the time being. The studied tactics of Nelson, however, were not required by Admiral Togo as the superior force of the Japanese used without fear made the defeat of the weaker Russian certain beyond any doubt.

Farragut at Mobile Bay, August 5, 1864, passed the forts successfully, accepting the risk of damage by mines believing that, due to the known deficiencies of ordnance science of the day, long exposure to salt water had rendered the major part of them innocuous. The low velocities and the consequent small penetration of guns of that day, together with the tactical ability of its leader (shown in one respect at least by the lashing of his vessels two abreast), and of his boldness which bade him take the chance of mine explosions, enabled the fleet to pass the forts. The method of sweeping for mines adopted by the *Brooklyn* at that time was somewhat akin to present practice. To the heavy fire from the fleet and the smoke therefrom is attributed the small number of injuries received by the American fleet on that day.

A narrative of a few modern sea fights illustrates the conditions that have been imposed upon tactics by gunnery and vice versa. A study of the different conditions there existing will no doubt give a line upon the solution of the question and point us fair, so that all have to agree that the use of tactics and of gunnery must be unrestricted one by the other.

The Russo-Japanese war affords the first example of the use of modern, high-powered, long-range weapons equipped with sufficiently good sights and other appliances to render gunnery accurate at ranges not hitherto considered possible.

*Battle of the Yellow Sea, August 10, 1904.*—The Russian fleet immobile in Port Arthur made a sortie about daylight with the object of uniting with their squadron based on Vladivostok. This movement resulted in two distinct contacts with the Japanese



vered in squadrons with the Russians in single line. The Russians ought to have been sunk instead of being dispersed. At dark the Russians were surrounded by the torpedo fleet and repeated attacks were made against them, many torpedoes being fired. The cautious tactics of the Japanese prevented a decisive end to the action.

*Tsushima, May 27, 1905.*—The Japanese fleet maneuvered in squadrons and by superior speed kept the Russian fleet, then in a long flung unwieldy column, under superior gunfire. The weather was too rough for destroyers. These vessels made their attack upon scattered units of the enemy at night when the sea moderated. Scouting had indicated to the Japanese the formation and course of the enemy; radio signalling, then in its infancy, making the imparting of such information possible. The Japanese concentrated on van and rear, maneuvered by squadrons and kept the action at long range by utilizing superior speed and gun power.

At the commencement of the world war, August 4, 1914, the British navy began that continuous patrol of the North Sea, scouting close in to the German coast, which resulted in many contacts of the hostile forces with several casualties in both single and squadron engagement; the first being the sinking by a mine of the British light cruiser *Amphion* in the afternoon, August 5, 1914, immediately following her successful attempt to destroy the German mine layer *Königin Luise* at some sixty miles off the Suffolk coast. The British destroyers and the *Amphion*, after a long chase of over thirty miles, accomplished this by their accurate gunfire, which tore away the *Luise's* bridge, damaged her bow, and smashed the propeller.

The largest guns used in this action were the four-inch, and reports indicate that the gunnery was excellent; all conditions favoring it, the range altering but little during the chase and making, in the smooth water with no demoralizing return shots, good marksmanship as simple as a target practice maneuver.

On August 10, 1914, in the North Sea, a British light cruiser squadron engaged several German submarines, the presence of the latter being indicated solely by their periscopes, which left their usual tell-tale wake. By the British, speed and changes of course were utilized to confuse the Germans, and then some bril-

liant gunnery by the *Birmingham* shattered the periscope of the *U-15*. Blinded, the latter dove under water and her consorts made off. Eventually she came to the surface only to receive a shot from the *Birmingham* which struck the base of the conning tower, ripping the whole structure clean out of the submarine, which sank like a stone.

The British, by utilizing high speed and frequent changes of course, together with accurate gunnery, developed at the very outset of the war proper tactics for fighting the undersea craft, for even under date of March, 1917, it was noted in authoritative dispatches from abroad that direct gunfire from the decks of men-of-war and auxiliary vessels had proven a most effective method employed in the destruction of submarines.

Thus it is seen that, but a few days after the war was on, the British navy discovered that good gunnery still proved to be a most efficient and practicable way to destroy submarines. The effectiveness of the depth charges dropped overboard, although at random, was soon improved by supplying new types of guns suited for such a special purpose and using gunnery in their employment. Tactics in these combats dictates speed and changes of course to avoid the attack and the use of good gunnery to destroy the attacker. This method is of course not sufficiently spectacular to attract popular comment for it lacks the means of stirring imaginative persons into inventing peculiar bombs, nets, guns and freak torpedoes. Nevertheless the real enemy of the submarine is good gunnery combined with tactics, the use of which soon destroys its power of damaging its prey.

*Bight of Helgoland, August 28, 1914.*—A British reconnaissance in force of the waters adjacent to Helgoland, begun late on the night of August 26, 1914, resulted in an engagement of considerable importance that lasted throughout the day of the twenty-eighth. A great number of gun duels took place between light cruisers and destroyers of British and Germans. The British generally possessed six-inch guns opposing them to four-inch guns of Germans. Ranges were between 4,000 and 3,000 yards. The British *Arethusa*, outnumbered, was severely damaged by gunfire. One German submarine is known to have been destroyed by gunfire. The German *Mainz* after but twenty minutes of action was disabled and on fire, being sunk soon after. The British

battle-cruisers came in at the proper time to rescue the *Arethusa*, then being chased by the *Köln*, and in turn chased the Germans.

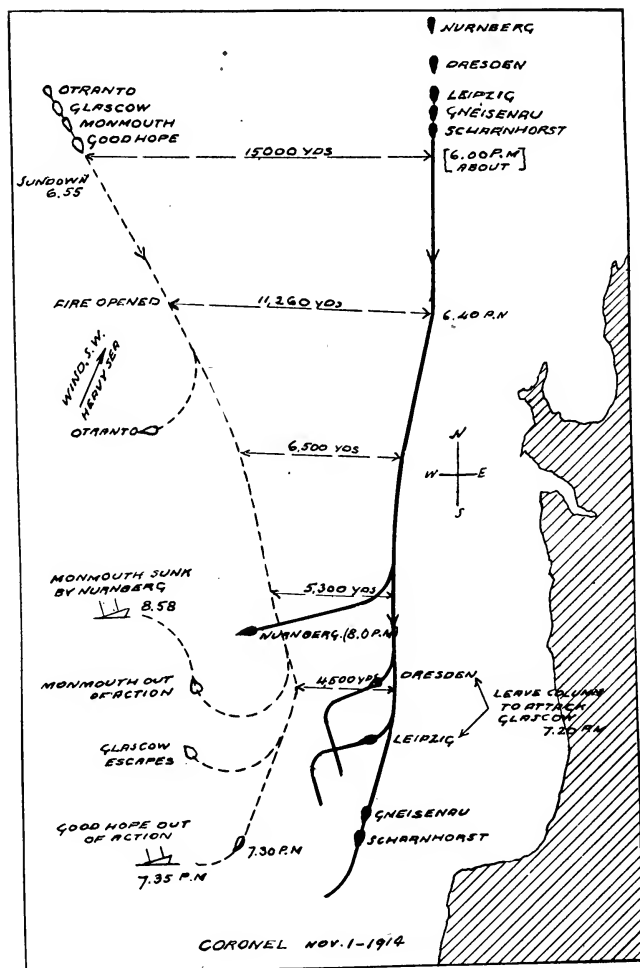
At 12:56 P. M., during this chase of the *Köln*, occurred the most spectacular incident of the day from a gunnery standpoint. The German *Ariadne* suddenly appeared on port bow of the *Lion* and steered at high speed at right angles to the *Lion's* course, the latter vessel firing two salvos that could not have included over four shots each, making sufficient hits to cause her to take fire and sink shortly afterwards. The rate of change of range, the *Lion* steaming twenty-eight and the *Ariadne* twenty knots, was thus from 1,000 to 500 yards per minute, thus overtaking any system of fire control. That hits should be made at this rapidly changing rate was certainly "very creditable,"<sup>1</sup> to say the least. The battle-cruisers steamed to the northward and then northwestward sinking the previously damaged *Köln* about 1:25 P. M. Shortly afterward, both the *Queen Mary* and *Lowestoff* were attacked by submarines without damages accruing to either side. Thus ended a busy day, filled with all varieties of actions, the British light cruisers being saved from destruction by the timely arrival of the speedy and heavy-gunned battle-cruisers.

So again is illustrated the fact tactics call for the greater number of ships to ensure victory; that ships by steaming at high speeds with frequent changes of course can operate safely among submarines; that torpedoes seldom hit, even when—and numerous ones here were fired—at ranges of less than 6,000 yards.

The battle was won by gunfire. To the heavier armament of the British can be attributed their success in far greater measure than to their superior gunnery. Even the *Strassburg*, the largest German cruiser engaged, had but four-inch guns.

*Coronel, November 1, 1914.*—The British squadron in the Pacific cruising off the Chilean coast, was spread out in scouting formation, course northeast by east, order of ships west to east, *Good Hope*, *Monmouth*, *Otranto*, and *Glasgow*, and was proceeding at fifteen knots away from the heavy seas made up by the strong southwest gale, when they heard, at 2:00 P. M. on November 1, 1914, calls upon the radio indicating the presence of enemy vessels. At 4:20 the *Glasgow* sighted to the eastward the German squadron of four ships steaming on a southerly course,

<sup>1</sup> Beatty.



and the British vessels then closed in on the *Good Hope* steaming northwesterly courses. Upon the completion of this evolution at 5:30, they headed around in columns on the southerly course with the Germans seven miles distant to the east steaming south, the ships of both squadrons pitching into the seas and taking water over forward. The overcast sky, lightening towards sunset, silhouetted to the Germans the forms of the British ships to the westward.

German column order was *Scharnhorst*, the gold medal gunnery ship of that navy, *Gneisnau*, *Leipzig* in column at 400 yards, the *Dresden* one mile astern, with the *Nurnberg* much farther to the rear.

The failing light made the Germans a difficult target. At 7:03 P. M. fire was opened at range of 12,000 yards, the first shots coming from the Germans. The squadrons now were steaming to the southward into the sea on slightly converging courses, the vessels firing at their opposites. The growing darkness and heavy spray thrown up by the seas made handling guns and accurate firing very difficult, the British main deck guns which comprised the major part of their armament constantly being flooded by the seas. The spotting was seriously handicapped, due to the seas that swept the bridges and decks. The small cruisers made very heavy weather.

The third salvo from the Germans caused fires to break out forward on both the *Good Hope* and *Monmouth*. This certainly was getting the range quickly despite the rough weather. As soon as the Germans observed hits they changed course to parallel the British. The *Otranto* here left the British column and steamed away to the southwest. Range became about 6,500 yards and the Germans bore off a point, but the British changed their course and reduced range to 5,300, possibly with the idea of firing torpedoes. The moon now rising made the German vessels better targets for the British and so the former bore away slightly in order to change and increase the range. Darkness had come on, the range-finders on the German vessels used the fires on the *Monmouth* for awhile, but range-finding, spotting and pointing soon became impossible with the result that firing was stopped at 8:06. During the battle it is claimed that the *Scharnhorst* was hit but twice and the *Gneisnau* only four times. About 7:50

a column of fire from an explosion shot up between the stacks of the *Good Hope*. Total destruction must have ensued. About 8:00 P. M. a very heavy rain squall occurred. The *Monmouth*, down by the bow, turned away to get stern to sea. The German light cruisers were directed at 8:00 P. M. to follow and attack British with torpedoes.

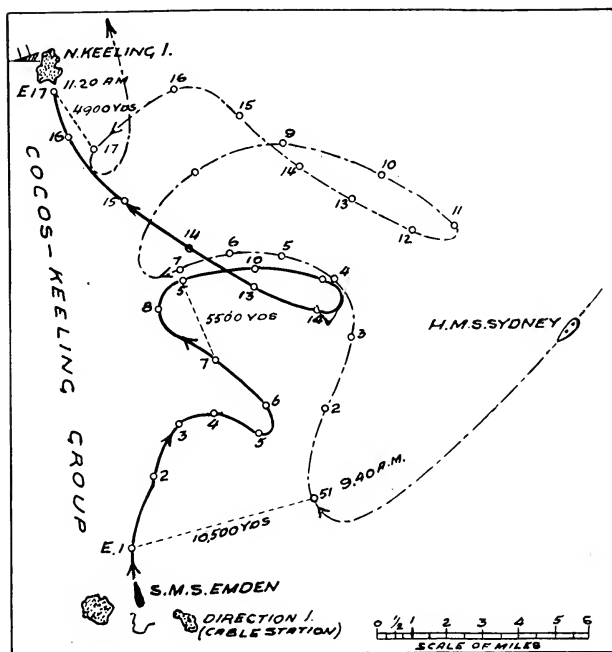
About 9:26 the *Monmouth* was encountered and sunk by gunfire at closest range by the *Nurnberg*. The flashes of this late night action were observed on the *Glasgow* standing away to the southwest straddled by splashes from the shots of the pursuing *Leipzig* and *Dresden*. The heavy sea prevented any work of rescue on the part of the Germans.

The Germans had sixteen major-caliber guns to the British<sup>2</sup> two, although, as the former could not use all on the same broadside, the figure should really be quoted as twelve. The British had thirty-two six-inch against the German twelve. However, the Germans are reported to have had an excellent director firing system in this action, and this very probably accounts for their superior gunnery.

*The "Sydney" and "Emden," November 9, 1914.*—The German cruiser *Emden* about daylight landed a party on Direction Island with instructions to destroy the radio and cables. While this party, under the command of the executive officer, comprising forty-nine out of the *Emden's* crew of 361, was absent, the Australian cruiser *Sydney* was sighted at 9:20 steaming in towards the island, whereupon the *Emden* promptly steamed out for battle. At 9:40 the *Emden* opened fire, the *Sydney* promptly replying, sheering out so that the range could be kept great, an advantage she desired because of her heavier guns and one which she could maintain because of her greater speed; as one of her officers wrote, "We had the speed on the *Emden* and fought as suited ourselves." The *Emden's* fire was rapid and accurate at first but as the *Sydney* began to hit the gunnery of the *Emden* grew less and less efficient. A lucky shot at the very beginning carried

<sup>2</sup> "The fate which befell Sir Christopher Cradock was due to the inferiority of the ships under his command. He might have declined battle. To an officer of his chivalrous and daring nature that alternative was impossible. Not long ago, as a veteran, he rode second in the Grand Military at Sandown, and only lost by a neck. If he had been in command of a gunboat he would have fought."—Earl Brassey.





### SYDNEY VS. EMDEN NOV. 9-1914

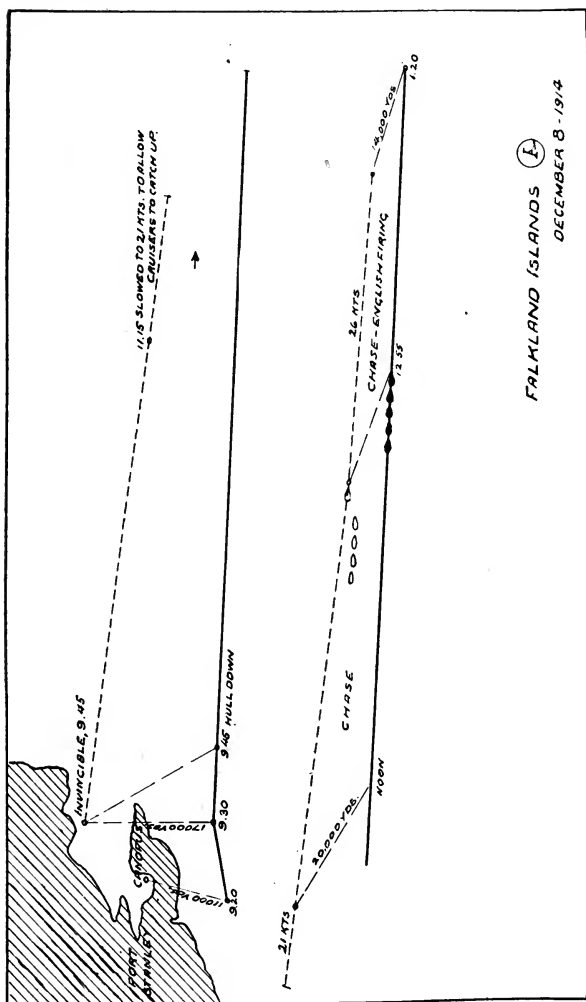
away all voice pipes of the *Emden* and in consequence centralized control of fire was thereafter not feasible. The *Emden's* smokestacks were shot away one by one so that her speed was further reduced. The opening range was 10,500 yards, a very long flight for the four-inch shell of the *Emden* and a range that gave a great advantage to the six-inch guns of the *Sydney*. The *Emden* made every endeavor to close the range (note the course at position 7 of chart) in order to overcome the odds of small guns and also to make a torpedo hit, her movements being rendered difficult because of damage to steering gear. The *Emden's* ammunition supply also gave out before the end of the battle. The

heavier shell soon decided the action, and, at 11:20, the beaten *Emden* grounded on North Keeling Island. The *Sydney* then left to pursue a merchantman, only to return at 4:25 P. M. when she fired the final shots at the *Emden*, which promptly surrendered.

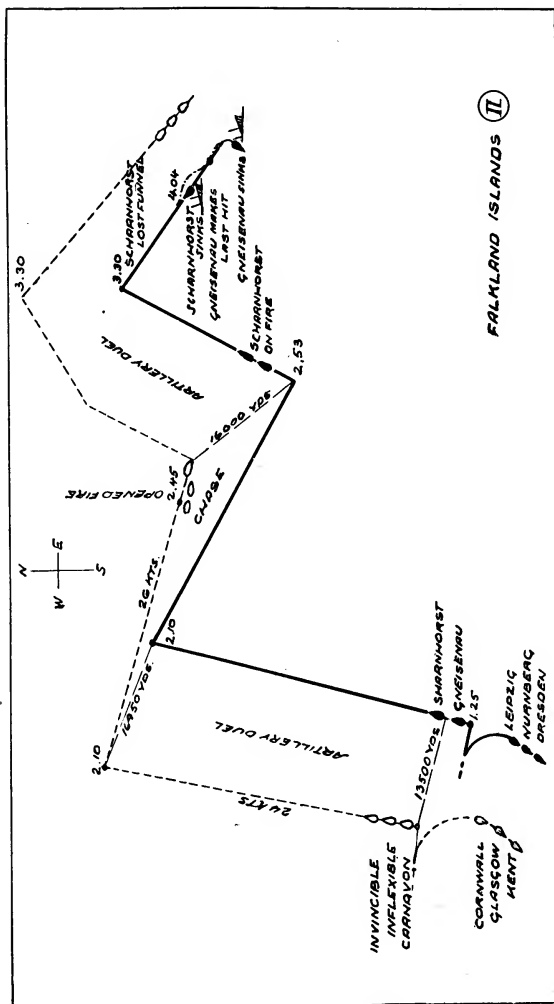
The *Sydney* received but ten hits, the damage from which was "surprisingly small," while the *Emden* had been hit severely and had sustained 129 casualties out of the 320 on board. The ineffectiveness of the German gunnery can be laid to their Admiralty's policy which provided such small-calibered guns for a vessel destined in the very nature of things to cope with vessels of the same type that were armed with guns of a heavier caliber.

The Germans did in this engagement what they repeated since, that is, attacked at early daylight important British ports with the result that when discovered and reported a long daylight remained during which the stronger British forces could search out and defeat them. Thus the Germans, engaged upon the task of destroying radio and cables, the work of but an hour, had appeared off Direction Island at early daylight with the natural result that the station was able to get through a message to the British vessel conveying troops some fifty miles to the eastward: "Strange war-ship . . . off entrance"—which message was sufficient to bring the *Sydney* at high speed to the island where the whole day remained available to her for the purpose of destroying the *Emden*. Gunfire, the tactics of the duel being governed by superiority of these weapons, accomplished this without material loss, as at no time was it necessary to close in order to hasten the end desired.

*Falkland Islands, December 8, 1914.*—This is one of the most interesting battles of the war from a plain gunnery standpoint. The British here used long-range firing, maintaining the range as they wished because of superior speed. Heavier guns and greater speeds were advantages that could not be offset; and, to make the odds worse, Von Spee had approached to attack at early morning. If he had waited till evening or, when seeing that he was outmatched, had turned sharply to southward and westward—either of these acts sufficient—more of his squadron would have escaped. And yet even when he saw it was too late to escape by flight, Von Spee had a "Cradock choice" but did not take it.



FALKLAND ISLANDS (F)  
DECEMBER 8 - 1914



He could have steamed into Port Stanley and attacked the British in the harbor, at anchor, and with steam not yet ready. It would have been a gallant fight, a desperate short-range action, and much damage might have been done before he could have been eventually defeated.

The maneuvering of Sturdee, voluntary for the sake of safety, explains his bad shooting, as his fire control methods would not permit such without detriment. Sixteen twelve-inch guns in action for five hours before two armored cruisers—either of which should have succumbed to twelve hits—were destroyed. Gunnery was surely not the equal of tactics at the Falklands.

The *Canopus*, lying in Port Stanley, opened on the Germans, firing across the land at 9:20 A. M. The British at that hour were feverishly completing coaling and raising steam. The Germans came on until the tripod masts of the *Inflexible* and *Invincible* were seen. The odds against them being thus disclosed, they steamed to the eastward, and a long running fight commenced. At 12:55 fire was opened at 16,500 yards by the British on the *Leipzig*. The British light cruisers attended to the light craft of the Germans, and the battle-cruisers from 1:20 P. M. engaged the *Scharnhorst*—sunk at 4:17— and the *Gneissau*—sunk at 6:00. The ranges used were from 13,500 to 16,500, altered at will as the German shell struck or fell short.

The chivalry of the sea, so sadly lacking in the submarine warfare, was not wanting here, many lives being saved by the British seamen who spared no effort or risks to rescue German seamen.

*Dogger Bank, January 24, 1915.*—The British battle-cruiser squadron under Vice Admiral Sir David Beatty, accompanied by light cruisers and destroyers, had put to sea on night of 23 January from Rosyth as information that German battle-cruisers, light cruisers and destroyers were out had been received. At 7:20 A. M. the next day, the *Aurora* signalled "Am in action with High Seas fleet." At 7:45, the Germans whose course had been N. N. W. turned sixteen points and at a speed of fifteen knots steamed E. S. E. with Beatty in full pursuit, his heavy battle-cruisers attaining the speed of twenty-eight to twenty-nine knots. The *Lion* and *Tiger* because of their superior speeds gradually drew ahead of the *Princess Royal* and she ahead of the *New Zealand*, and the *Indomitable*. The first sighting shots were fired by



*Lion* at 22,000 yards, falling short, and firing commenced after the first straddle was made at 9:05 A. M. From 7:25 to 9:30 A. M. the British had closed the range from 28,000 yards to 17,000 yards, or at that rate of about 4,800 yards per hour.

At 9:30 range was 17,000, and at 9:50 had decreased to 13,000, the closest of the action. It was at 9:35 that signal was made on the British flagship to "engage corresponding ship in line." The *Tiger* did not get this order so that the *Moltke* was left undisturbed by shells to get in her fire on the *Lion*. To open the range the Germans changed course sharply to north under cover of a destroyer feint and smoke screen. At about 10:00 A. M. and for a short time thereafter, both sides did very ineffective gunnery. A destroyer attack at 12,000 yards received effective fire from *Lion* and *Tiger*, the attack being quickly abandoned. In a running fight such as this the Germans zigzagged to reduce effect of British fire as well as to keep their guns in action. The British adopted lines of bearing, and as guns became blanked in firing, changed together one point to port at least twice in order to keep the maximum number of guns firing.

The German battle-cruisers *Seydlitz*, *Moltke*, *Derfflinger*, and *Blucher*, maintained their E. S. E.'ly course at top speed as a squadron until towards 10:30 A. M. when the *Blucher*, hit heavily, was left behind to her fate. This vessel had been dropping astern gradually, and, at 10:48, she hauled out to port, steering north being on fire and having a heavy list, where she sank at 12:05 P. M. The *Lion* was hit frequently and, at 10:52 A. M., to avoid submarines, British changed eight points to port and quickly thereafter to N. E. in order to close the range. As the *Lion* drew out of battle at 11:07 A. M., Beatty hoisted signal, "Keep nearer to the enemy." Unfortunately the action instead was broken off, and the chance of annihilating Germany's battle-cruisers gone. When Beatty managed to transfer his flag to the *Princess Royal* via the destroyer *Attack*, it was impossible to again enter action as the Germans had escaped in the distance and the opportunity had gone.

The first ranging shots in this action were fired at 22,000 yards, hits began at 18,000, the range decreasing rapidly, but the change of range and its rate of change were very gradual and fairly constant, while the size of the target was at a maximum, the whole

length of the ships being presented. Ideal conditions, those were for good gunnery, and while fewer hits than expected were made much progress towards greater accuracy has been made since. To lessen the damage accruing by skilful fire control, changes of course, together with destroyer attacks and smoke screens were used. The gun alone decided the tactics in this battle between these lightly armored and speedy ships. The heavier guns belonging to the British and the range being great, the bigger volume of fire and the close action, the importance of which was considered by the German navy to be greater than larger-calibered guns, did not help their battle-cruisers, which abandoned one, the pioneer of its type, to certain destruction and fled. The lesson evidently is that in actions between similar vessels the ones that have the heavier guns will possess the control of the blue water. As the power of the gun, and consequently the effective range of modern battles, increases, so does the realization that control of gunfire must increase in skill become more evident.

*Jutland, May 31, 1916.*—The German fleet was in the habit of making from time to time various two-day cruises in the North Sea as an entire unit in order to train its personnel. The British fleet was desirous of a contact, but due to distant bases and the extensive German mine fields found it difficult to time its movements, so as to arrive at the proper time to give battle. On May 31, 1916, the British battle-cruisers left Rosyth and the British grand fleet, Scapa, for a rendezvous in the North Sea. Due to some miscalculation the two parts of the fleet were still separated by some miles at the time when they had desired to join. The British fleet comprised twenty-nine dreadnoughts, nine battle-cruisers, nine armored cruisers, twenty-three light cruisers, and 147 destroyers. The German fleet was out on one of its exercise cruises, steaming in battle formation with light cruisers and battle-cruisers ahead, and comprised sixteen dreadnoughts, five battle-cruisers, six pre-dreadnoughts, fifteen light cruisers and about 123 destroyers. The force engaged in the action that commenced at 3:48 P. M. thus consisted of the largest number of vessels in a sea fight in modern times. This battle of the Jutland, or Skaggerack, is one in which ships and fleets maneuvered freely, changed courses by ships to avoid torpedoes frequently, and zigzagged in order to derange gunfire. When the



latter was too heavy, destroyers made smoke screens and attacked with torpedoes.

The weather was clear, wind light and variable, the visibility varying from 21,000 to 10,000 yards. The action between the six British battle-cruisers and the five German opened at 16,000 yards. The fire was rapid though but few hits were made. Fifteen minutes after the action commenced a chance German shell caused the destruction of the *Indefatigable*; just a great black cloud of smoke rose in the air some 300 feet, and when it dissipated, the fine vessel was gone.

At 4:08 the British battleships of the *Warspite* class came into action with light cruisers astern. The superiority of the British was met with a destroyer attack by the Germans and as the English destroyers met them, a fierce engagement occurred between the lines which ended in the retreat of the Germans. At 4:30 the battle-cruiser *Queen Mary* blew up and sank. Again the Germans had made an extremely lucky shot for them. The hitting on neither side was constant or rapid, the long range made director-firing essential but even that was very difficult, due to smoke, water, and funnel gases. Range keeping was not perfected and the changes of course threw out the gunnery. Light began to fail at 4:30, and, as the fight went on, the range finders became increasingly inaccurate. The Germans had the best of the light.

As the German battleships were sighted, at 4:42, Beatty turned to starboard eighteen points, Von Hipper doing the same. At 5:52 the British fifth battle squadron counter-marched to port, received a fire from the German battleships, and engaged the German battle-cruisers at 14,000 yards. About 5:55 the British grand fleet came into action, and at 6:10 the Germans turned to the right 360°, Beatty changing course to east to pass ahead of the British battleships and take station on its eastern flank, the range being now 12,000 yards. At 6:30 the British fire was effective on the German line. At 6:35 Rear Admiral Hood was lost by the sinking of the *Invincible*. The German *Lutzow* left the line at the same time. Visibility grew worse rapidly, the enemy turning southward under fire at but 8,000 yards. Destroyer attacks and smoke screens aided the Germans in their turn southwest. The battle continued intermittently from 6:17



to 8:20 P. M., at ranges from 9,000 to 12,000 yards. The Germans kept on towards the west, the *Weisbaden* having sunk at 7:00 A. M. The *Warrior* was severely damaged and lost the next day. The fleets<sup>3</sup> lost contact during the night and made port next day.

The Germans apparently concentrated their fire, as battle-cruisers next in line to the ones sunk were hit but seldom. With enemy zigzagging, shells striking and detonating, water<sup>4</sup> deluging decks, destroyer attacks, torpedoes, smoke screens and funnel smoke, the conditions of target firing were certainly absent and one can believe that the personnel would be at not much over fifty per cent efficiency. The gun pointers could see practically nothing. The accurate shooting of target practice was wanting and rate of hitting could not have been over one hit per gun per two hours.

At long ranges, such as these, gun pointers could seldom see the target and hence the director method of aiming had to be used. Gun fire was the main factor in this, as in other battles, an enormous number of rounds being fired. The damage done by the Germans, armed as they were with lighter guns must have

<sup>3</sup> Comments on Jutland. On several occasions on 31 May, vessels reappeared from the mist, and fire had to be immediately re-opened before a single rangefinder reading had been obtained. These conditions will always be experienced frequently and so they cannot be considered other than usual, and provision must be made accordingly. The necessity for instant means of enabling the captain to put the control officer, director pointer, spotter, guns and rangefinder on to the target selected was demonstrated many times during this battle.

The general impression was that, at first, fire was very rapid and accurate for range, but frequently bad in deflection; the spread was, as a rule, small. It is interesting to note, however, that no ship which survived the action appears to have been hit by a complete salvo; on several occasions ships were undoubtedly hit by two shells in one salvo, but generally speaking only by one. Instantaneous salvos and some form of very rapid ripple were in use.

After starting quickly, and establishing hitting in a very short time, the German fire fell off gradually. Whether this was due to the fact of their ships being hit, causing a lack of accuracy in the use of their fire control system, or whether it was due to zigzagging to avoid being hit, or whether due to visibility conditions is not known. There is no doubt that after 6:30 P. M., their firing was indifferent, but the light conditions were then entirely reversed and this may be sufficient to account for it.

The efficiency with which the Germans concentrated a rapid fire from more than two ships on a particular ship or on a turning point of the British column, was very creditable.

<sup>4</sup> The water from the splash of a 12-inch shot weighs about 1,600 tons, it being 120 to 130 feet in height.

been due to the fact that they maintained a great rapidity and volume together with a greater accuracy of fire.

Tactics of the fleet in sea battles initiated by DeRuyter and perfected by Nelson have been shown to the world in different phases, by Farragut, Sampson, Togo, Jellicoe, and Beatty. All these felt the restrictions of movement enforced by the limitations of modern gunnery, which ought no longer to exist. The adoption of real fire control and thus real gunnery should enable battle tactics to be developed without the irksome necessity of considering what will happen to the accuracy of the fire when unexpected changes of course or speed are made.

The fleet of Rear Admiral Sampson at Santiago, July 3, 1898, obtained but a percentage of 3.3 hits<sup>5</sup> with the mean range only of 1,800 yards, when excluding the *Oregon's* few shots at the *Colon* fired at her extreme gun range of about 11,000 yards. During the battle there was practically no maneuvering and nothing else to interfere with accurate gun fire. The personnel was surely equal to that of the present day, the poor results being due in the main to slow loading arrangements, poor sights, low velocity guns, and so on. In other words, matériel was then far behind the personnel. The telescope sight was there, but not sufficiently rugged to stand the shocks of gunfire, it being still crude, though much improved upon the first. The result of the battle was such that Santiago did not emphasize the lack of good control in the gunnery line sufficiently to arouse the navies of the world to its needs.

Even at Tsushima in 1905 the gunnery range had increased to but 9,000 yards, this latter increase being permitted by the gunnery improvements made in the interim. Such gunnery improvements are responsible for the changes in tactics and the disposition and caliber of main battery guns.

The real awakening and start of progress came along in the years 1901 to 1903, when matters in the gunnery line began to hum. Sir Percy Scott gave the gunnery of the English fleet a jolt on the China Station that was transmitted by Admiral W. S. Sims to the American fleet. Gunnery became a fetish, and

<sup>5</sup> Of course, as the enemy obtained a far lesser percentage of hits, this lack of efficiency in shooting was not very important or serious to our fleet.

in 1903 the late Professor P. R. Alger published his remarkable essay on gunnery which stirred our own navy to further efforts.

The range of 300 yards in Nelson's day produced slow ships and close action, while many calibers of guns were included in the batteries of vessels. In 1848, our ordnance had only just commenced to evolve into present-day types; and it is an interesting fact that in said year there devolved upon Commander J. A. Dahlgren, U. S. Navy, the task of equipping all our navy cannon with sights! The firing ranges were still inside of 2,000 yards, the pivot gun shooting a projectile of sixty-eight pounds being the main reliance in ships' armament; and again, in 1856, Dahlgren enunciated as a leading principle of ordnance that "the main element of ordnance power is represented by one caliber." Attempts had been made to follow that principle from time to time, but it was not really accepted and adopted by the world until Naval Constructor R. R. M. Robinson reproduced the idea practically in the *South Carolina*, and later in the *Delaware* type.

The telescope sight of Rear Admiral Fiske, improved by Commander Mustin, rapidly pushed possible ranges to the extreme limits of visibility. Gunnery then soon had to seek for better means of laying guns and controlling their fire.<sup>6</sup>

The first real attempt at long-range firing was made possible by the modern director systems of fire introduced in the British navy by Captain Percy Scott, R. N., in 1911, on the *Neptune*. Long ranges thus became no obstacle, as the pointer at the director scope installed higher than the guns, could fire as soon as the

<sup>6</sup> In gunnery, as well as in other sciences, progress goes in a circle, one that constantly increases in size as its limiting factors are rendered less restrictive by improvement in mechanical arts. So now we see navies again using the system of gun pointing and firing known as director firing, a type that was first introduced into the gunnery art by Captain Richard Kempenfeldt—lost on the H. M. S. *Royal George*, 1782—in the days when ranges were exceedingly short.

This circle of gunnery was completed with the re-introduction of the Kempenfeldt system in the director firing methods of Captain Scott, R. N. Such a "fire director," mounted in the foretop, was fitted to the *Thunderer*; and, in September, 1912, two crack gunnery ships of the British navy held competition trials off Bantry Bay. The *Orion*, not equipped with a fire director, in smooth weather did as well as the *Thunderer*, the errors under such a condition being those due to the inherent dispersion of guns, towards the reducing of which the best efforts of both ordnance and gunnery officers are still being directed. In rough weather, however, rolling five degrees and over, the *Thunderer* shot five times as well as did the *Orion*.

masts of the target appeared above the horizon. In fact it is recognized that in the battle of Jutland the enemy target ships were much of the time invisible to the pointers because of the interference of the splashes, the powder and the funnel smoke quite as much as because of the low visibility conditions; and, without the directorscope, accurate firing would have been impossible.

After this start in the present gunnery—which insured sea fights at long ranges, the next steps were taken with the view of keeping the range after it had been once obtained. Methods in vogue up to and including the battle of Jutland did not succeed in accomplishing this, but improvements in the methods and the instruments for range-keeping have worked wonders, until it is confidently believed that battle fleets of the world have a fire control system that will keep the target straddled by salvos, be the changes of speed and courses by both firing ship and target what they may.

The ranges at which modern sea fighting take place are variously estimated by our highest authorities, many claiming that not over 12,000 yards will be the determining range. Our target practices cause us to believe differently and to concur with the commander of the British fleet at Jutland, Admiral Jellicoe, who stated in March, 1916, that “ships of today open fire at 22,000 yards range and gunfire begins to be very effective at 18,000 yards”; and we believe that a 30,000-yard range is now not improbable.

Long-range target practices began to be held in our fleet, these being at ranges at first of but 4,000 yards and at stationary targets. But as ranges increased, so did the matériel improvement; it had to. The officers demanded the best and all gunnery started upwards.

Many able officers devoted their brains and their energies to the development of fire control, both organization and matériel. The principles involved were recognized and instruments to effect the desired results were gradually produced. Ammunition handling, rugged and immobile sights with better graduations, range finders, clocks, and projectors, all came in for much attention.

The Russo-Japanese war had showed quite clearly to all navies that long ranges were to rule in modern sea battles, and that the

fleet having the best sights, gunnery, and fire control instruments, and organization was bound to win.

So by 1911 it was not unusual to obtain thirty per cent of hits at 11,000 yards under open sea conditions with our pre-dreadnoughts. It is axiomatic that to hit successfully at long range one must obtain correct ranges, apply the sight bar correction for atmosphere and temperature conditions, reduce dispersion to its minimum, spot the salvos on, and then keep the range after once it is found; a problem intricate in a high degree as the rate of change of range must be kept even though it is varying constantly due to one's own and one's target changes of both course and speed. The errors of rangefinders were reduced gradually to twenty-five yards in 6,000 yards by the training of their operators, and by improvements in the instruments both in size and ruggedness. Not only must any successful fire control system accomplish the foregoing but it must also enable the firing ship after once on a target to shift that target at any time without suffering a loss of accuracy.

Greater and greater ranges came within the possibility of ships as the power of guns increased, and as the necessity for keeping away from the long range torpedoes became apparent. Visibility then soon began to be a limiting factor in gunnery and hence the tops became the logical places from which to direct the fire.

The directorscope mounted aloft became a fixture in all navies, and, as a result, ranges at target practice of over 20,000 yards, with higher percentage of hits than at Santiago, are now common; while in the future ranges of 30,000 to 35,000 may be expected, visibility being the only limiting factor. In battles during the world war, an extreme of 18,000 yards has been noted, but such an extreme range was not maintained, the ranges closing to 14,000 yards and less before decisive damage was inflicted.

Even with long ranges, modern battles indicate that the best shooting ships at target practices can be expected to give the best accounts of themselves in battle, as witness the record of the *Scharnhorst*.

Mechanical methods for gunnery control are decidedly necessary in battle. One knows, if the slightest unexpected incident occurs in target practice, how the poise and skill of gun personnel are upset and with what fatal results to the score. How

much greater will this be in battle<sup>7</sup> is easily comprehended. The usual estimate is that the mentality of a gun's crew is reduced in the strain of battle to fifty per cent of the normal. Such conditions, together with the noise and shock, naturally reduce normal mentality in a marked degree. Our mechanisms, not only for loading but for accurate shooting, must be made then so as to depend more and more upon the mentality of a few, that is they must be aided by the best mechanical and electrical appliances possible.

To insure good gunnery the best means that can be developed are adopted to insure correct sight bar range or elevation of the guns, errors in which magnify the errors in increasing proportion as the range increases. Other varying quantities to contend with are the constantly changing speeds and courses of your own ship and those of the target enemy, the atmospheric conditions, the obscuring of enemy by low visibility, by shell splashes, by other vessels or by smoke screens of destroyers or vessels themselves. Due to these conditions the rapidity of heavy gunfire with modern turret guns handled safely is not much over two per minute although loading times are short enough to permit many more rounds to be fired.

In the simplest conditions of gunnery we find that a stationary ship is able to hit a stationary target at a very satisfactory rate; but that as conditions change this is decreased greatly, as at target practice, and still further in actual battle and therefore gunnery should aim at providing means for reproducing the stationary conditions no matter what courses and speeds are used by both firing ship and enemy. To do this is no easy problem indeed, but modern science applied to fire control has made great strides towards its solution. Into this question comes also the fact that a target is likely to be invisible practically as much of the time as it is to be visible, due to smoke of guns, to the funnel smoke of the firing ships or of the next one ahead, or to smoke screens of the enemy, to splashes produced by short shots, or to enemy ships afire, all of which require that the

<sup>7</sup> Whenever shells struck near the ships, great columns of water were thrown up which thundered upon and flooded the decks. Clouds of flying splinters fell upon the decks or whistled through the rigging. Great brands hurled by the bursting shells hissed and blazed on all sides, melting and charring everything they touched.—(Schriebe, *Battle of Jutland*.)



method adopted for keeping the range must allow for these conditions. The courses and speeds must be altered at will without detriment to one's gunfire if torpedoes, mines and submarines are to be avoided. To hit with a torpedo also demands a great accuracy in fire control appliances and in trained skill in operators, as the course and speed of the enemy are vital to success here.

Shore fortifications, because of the accuracy of their gunfire insured by their immobility and accurate range-finding methods, are practically immune from serious bombardments by vessels. The odds in favor of the fort, however, are somewhat reduced by modern fire control methods. Vessels now can or should be able to bombard effectively by indirect gunfire, changing course and speed at will, and even do so at night when the flashes of their guns will be the only target for the fort. Thus serious damage to morale, personnel, and matériel of shore positions must be expected when attacked by a fleet. Flashless powder, developed by the navy in 1918, by not disclosing the firing vessels by the bright customary flash, practically prohibits a fort's returning the fire of a night bombardment while flares or illuminating projectiles disclose it to the attacking vessels.

To bombard, if not underway on changing and various courses and speeds, insures the range of the vessel being picked up by the fort, even though smoke screens should hide her, for in this case her position can be located by sound ranging, aircraft spotting and gun smoke. After the range of the vessel has been picked up by the forts, and salvos are landed about her, discretion will indicate to her the wisdom of withdrawing at once. If, in order to approximate the stationary conditions, the vessel moves slowly, it will be the more easily attacked by submarines. Speed and ever-changing courses must be maintained by the vessel. Gunnery, for long years after the modern high-power guns came into use, did not permit such movements without its effectiveness being absolutely nullified thereby. Now, however, fire control should be perfected to a degree that the commander afloat can feel no such handicap. Once he obtains the range he will keep it; and when, as in the case of a fort, his target is immobile, he can never lose it no matter how fast or how changeably he may steam, all smoke screens notwithstanding. His immunity to torpedoes is greater because of his movements, and also to

mines because of modern methods of ship protection. Fire control has here made marked advances, and who can say with assurance that a bombardment may never be undertaken by a fleet, or by single vessels, underway.

Bombardments unless followed by strong land attacks do not give the measure of success that would warrant the risk of the operations. The modern examples of fort bombardments are the various attacks in the Dardanelles, the heaviest ones being those on March 1st, 18th and 25th, 1915. While the forts were seemingly silenced the enemy claimed that they were not seriously damaged and it is noted that they always resumed fire on the next attacks. A bombarding fleet must sweep for mines, must be prepared against submarine attacks, and must maneuver in order to make accurate return fire difficult. Without freedom of movement, casualties to ships are very heavy, and, unless the forts can be occupied, bombardments are without a gain commensurate with the loss. On March 19, 1915, for example, while engaging the forts at the Dardanelles Straits from 10:45 A. M. to 6:05 P. M. the battleships *Bouvet*, *Irresistible*, and *Ocean* were all sunk by mines, notwithstanding that sweeping for mines had been conducted carefully and systematically, while the *Inflexible*, because of the loss of her fire control stations, was put out of action. These bombardments did establish the power of the fleet to dominate fortresses by superiority of fire. All this is futile unless the fortresses are occupied by troops, for the damage done by the fleet is seldom real or lasting, the success is only momentary and spectacular, as forts can repair their damages and regain their former power far more quickly than battleships can be built.

The *Königsberg* was destroyed in the Rufigi river on July 11, 1914, by the monitors *Mersey* and *Severn*, the fire being governed by seaplanes. Salvos were fired slowly, about two every three minutes, and, after once spotted on, the hitting was of such an amount that in thirty minutes no fire was returned by the German vessel.

This action at the Rufigi River showed that after the range was once obtained, in this case after but eight minutes, a rate of hitting of one per gun per two minutes was obtained with a six-inch gun at about 10,000 yards, a rather long range for that

gun. Yet, on a previous occasion, the rate of hitting was about one hit per gun in four hours. This only shows what an extreme difference can exist between results given by a right method of fire control as compared with a wrong method, a ratio of 1,200. The tactics employed were correct but the use of gunnery on the first day was not efficient. The Jutland battle gave a rate of hitting of about one per gun per three hours at ranges never over 14,000 and for sometime from 12,000 to 8,000 yards.

Gunnery, of course, cannot insure hitting a target that constantly changes course, because to accomplish this it must possess the accomplishments actually possessed only by true prophecy. Nevertheless, the fleet in bombarding a fort does have this unknown factor eliminated and can derange the fort's fire by its own great mobility of such character that it in no wise will affect its own. Fire control in all navies does provide instruments designed so that changes of courses on the part of the enemy are quickly discerned and notice given to the fire control party.

In modern fleet actions all the conditions that existed at the Jutland, but intensified and added to, must be expected. Danger to all vessels existed in the air, on and under the water. Destroyers harassed the main fleets by their incessant activity with smoke screens and torpedoes, the water being literally alive with the latter. Torpedoes, with their long and even increasing ranges, fired promiscuously are a danger far worse than either the anchored mines or the floating mines drifting on the surface of the water. To defend oneself against the two latter paravanes and bow wave are generally sufficient, while to cope with the former speed with sharp and unpredicted changes both of speed and course are necessary.

For years admirals have been hampered by the fact that to even zigzag in an orderly manner would hopelessly derange modern gunfire, although it is a proceeding vital to success whether operating offensively or defensively. Whether or not such is the case now depends altogether upon the appliances fitted for fire control and the ability of the personnel operating them.

A fleet that constantly zigzags in battle and can yet keep hitting the enemy has an enormous advantage over one that cannot.

To change the range by unexpectedly altering courses and speed is the most efficient means of reducing the effect of an enemy's fire; but such is not possible unless your own gunnery is of the caliber that is able to keep the range of the enemy without harm to its own effectiveness.

Torpedoes, mines, and bombs, whether from surface, under-sea or aircraft notwithstanding, it is still the gun that decides the issue of all sea battles, and passively or actively it gives the naval power that commands the sea. The gun is the dominant factor, and tactics must use maneuvers and utilize speed so that the maximum gun power may be brought to bear on the enemy through guns well placed for maximum effect. To maintain the gun at its best for the longest time, a ship, by frequent changes of course and speed, must maneuver so as to vary the range of the enemy and thus lessen the accuracy of his fire by complicating his fire and control and, in order to avoid his torpedoes, zigzagging under fire is certainly necessary, and provision must be made so that the accuracy of your own fire is not harmed thereby. Freedom to change course and speed being then the requirements of modern tactics, gunnery must meet them, and so it does in an ever-increasing degree.

Scientific methods of range keeping and director firing in gunnery combined with seamanship of the old school remodeled to suit conditions, now have combined to such a degree that the commander of a vessel ought to feel free to change at any time speed, course, range, or target without losing any advantage or decreasing his offensive or defensive power. The mutual relations of tactics and gunnery thus have produced means whereby both may be used *ad libitum* without one thereby lessening the effect of the other. Both must excel and neither should hamper the other.

Gunnery then in the passing years has steadily progressed and may be said to be keeping pace with tactics, allowing the admiral free and untrammelled use of all its advantages. Such, we have seen, was not always the case, the increase in gun power being more rapid than the devising of exact methods to control it under all conditions at sea. However, fire control cannot do the impossible, and even if it is as perfect as practicable, the errors in the trajectories of guns at the ever-increasing ranges still make

high percentages of hits problematical. Gunnery is also devoting much attention to correcting variations in flight of shell at long ranges striving to overcome the unknown factors that are ever present in the problem.

New ways of using torpedoes, depth charges, aircraft bombs and other deadly weapons are constantly being devised. But gunnery soon meets each new weapon. No one doubts but that a sufficient amount of explosive placed at the right spot will sink or destroy any vessel whether in the air, on the surface of the sea, or under the sea. The difficulty is to place it there. All big ships were doomed when the torpedo was invented, and yet again when the destroyer came into being, yet again when the submarine was produced, and now great faith is placed in the powers of aircraft, both torpedo plane and bombers. Even several torpedo hits are not fatal. The *Marlborough* at Jutland fired seventeen salvos after being torpedoed several times, eluded a submarine attack, and after the battle steamed to her base at twenty knots. A greater number of vessels were destroyed by heavy gunfire than by torpedoes. The *Warspite* hit by only two high explosive shells was in a much worse plight than the *Marlborough* with her torpedo hits. Also the damage ensuing from the hits of heavy bombs dropped by aircraft upon old capital ships proved of far less extent than had been expected. The target presented by a torpedo plane's ninety-seven-foot spread is enormous, as is likewise that of the big bombing planes.

The use of suitable tactics of ships in battle line will reduce their chances of being struck by bombs from aircraft with even greater ease than now is the case in avoiding torpedoes. To one who has watched an attack by bombing planes how evident is the point they must reach to drop a bomb upon a moving surface vessel. How simple it is for the anti-aircraft battery of that vessel to make it impossible for the aircraft to reach the point necessary. Many new methods of locating and hitting attacking aircraft are practicable. The method now used by the duck hunter in aiming his shotgun may be adapted to directing the fire of the big guns acting against aircraft. The numerous machine guns, semi-automatic guns of larger caliber, and the easily manipulated anti-aircraft guns of larger than four-inch with their perfectly functioning fuses make the lot of an attack-

ing air-man anything but a happy one. To judge from experiences in the world war air pilots cared not to go over even the crudely directed batteries at Dunkirk and elsewhere. They will hardly dare to encounter modern anti-aircraft guns controlled with the efficient systems which are or will be devised to hit them both by day and by night.

The use of gas had added terribly to the dangers of modern war. There is an answer to that in like manner to which torpedoes, guns, and bombs have been countered. The bringing of gas in quantity to the scene of a naval battle involves problems in the solution of which not a real start has yet been made. If not invisible when spread, ships by tactical handling will avoid their neighborhood, the sea will soon dehydrolyze and render them innocuous. Then again, should an invisible lethal gas cloud pervade a ship, new masks not alone on individuals but on all intakes for air will counteract their deadly action, not to mention their real and most powerful offensive, or defensive if you prefer, antagonist; the cylinders of gas ready to release that immediately decompose the lethal gases made by man into the harmless ones which human beings are meant to breathe. Again the ventilating system of a vessel may be so constructed as to drive out noxious gases in a very short space of time. This is essential for even when the gas ejectors fitted to turret guns fail the turret's crew are greatly inconvenienced. While the best method of dealing with a gas attack is not yet in sight, it is certain that troops, cities or ships are not tamely going to submit to being gassed, as the advocates of gas warfare generally appear to think. There's another side to this gas question that does not appear often in print and that's the efficacy of the defensive methods developed to render its attacks innocuous.

Gas and the supergun of sixty-five or seventy miles in range may be used to drive a fleet out from under shore fortifications and compel it to seek the decision on the high seas. Gunnery will control the uses of both gas and supergun in such operations. The attacks upon fleets at sea by forces of air and gas are essentially difficult of execution. The airplane carrier is not yet developed successfully and when constructed along proposed lines will be a prey to the battle-cruisers of a nation provided with such vessels but will be a menace to a navy without huge battle-

cruisers with their thirty-two knots of speed in all weathers and 48,000-yard gun range.

Some class proper tactics as superior to any armor protection—*vide* "Speed is armor," Lord Fisher—such protection being at best but partial and vulnerable, and it being nullified by proper gunnery of the enemy, and its lack being compensated for by fearless tactics.

The gunnery officers, whom the crew and sometimes their mess-mates regard as crazy enthusiasts, imbued with the mad desire to reach one goal—a higher percentage of hits and greater rapidity of fire than before—have made modern gunnery what it is now, and are daily improving methods, while the effort of ordnance to make the matériel more perfect than the personnel never slackens, and as one by one its defects are brought to light, they are studied in the hope of overcoming them.

Be the instruments no matter what, without enthusiasm, training, and ability in personnel, an accurate and rapid fire cannot be maintained at long ranges.

. . . as long as man is human, we shall have to count on men,  
Though machines be ne'er so perfect, there may come a day perhaps,  
When you find out just how helpless is a heap of metal scraps.

—HOPWOOD.

So the navy puts full reliance in its gunnery officers, and they so work as to push the gunnery of the fleet to the highest pinnacles. Unhampered by the fear that inaccurate shooting will result because of free maneuvering, the commanders afloat now place their vessels where and when they wish in the endeavor to get the tactical advantages necessary for maximum gunfire effect.

The conclusion, therefore, should be that modern gunnery, the fire control being in skilled hands, at the present date can offer no handicap whatever to an absolutely free use of naval tactics in battle; and further, it has so advanced that, properly utilized, a ship even may venture once again, as in the days of our grand admiral Farragut to bombard shore fortifications, and do it with the chances of success in its favor. Gunnery now does not hamper tactics, and therefore, as is usual in the see-saw of progress, the battle tactics of the fleet units must develop and provide surprises and Nelsonian means to inflict an overwhelming defeat upon an enemy.

In the preceding pages mention has been made of a few of the many problems in both gunnery and tactics that await solution at the hands of ordnance and gunnery experts during the years of peace. History tells us that we now can expect at least thirty-one years of freedom from war. During this period we must keep advancing in the profession of warfare on the sea, bearing in mind, when discouraged at the little attention that will be accorded the navy by our countrymen, what would now be the state of the Anglo-Saxon world had the British seamen given up their intensive preparations and researches during the one hundred years of peace vouchsafed their navy just prior to the world war.

All things in gunnery are possible to him who sincerely tries, and skilful use of the tools provided will win the day when the next main fleet action becomes an actuality. Let us have faith in our brains and our tools, use them both, and then all will continue to be well with the navy.



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## THE SUPPLY CORPS SCHOOL OF APPLICATION

BY LIEUTENANT COMMANDER K. C. McINTOSH, S. C., U. S. N.

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The beginning of the fiscal year 1922 saw the start of an enterprise which has for many years been a dream of many officers of the supply corps. Schools of Application have been held in the past but they were convened for the purpose of instructing assistant paymasters newly commissioned from the ranks or from civil life in the use of blank forms and the routine of their seagoing disbursing duties.

I have the honor to be a graduate of the first of these schools. Twenty-three officers were commissioned in the corps from civil life on the same day. The "seagoing office boy" method of instruction could not at that time be applied to such a large class; and the school was established August 1, 1905, the course continuing a little less than two months. The pressing thing was to give us some knowledge of the mechanism of a gunboat pay-office, for we were all, of course, bound for sea at the first opportunity. At the end of the course we had acquired considerable practical knowledge on a small scale—of theory we had none. Such schools, like a certain well-known magazine, were convened "every little while" during the next fifteen years, as need arose. They fitted the new officer to understand what his more experienced pay clerk was talking about, and taught him how to check up his yeoman. Of his paramount duties in later years as a supply officer, practically no mention was made and no instruction was given.

The School of Application now in session is built upon an idea basically different. The business side of the navy surpasses, in its vastness, any existing corporation, and in its diversity, partakes of the nature of practically every enterprise in the commercial world.

Modern business is not done by rule of thumb. More and more it is a matter of applied theory, of constant study of cause and effect and of application of the results obtained to conditions which, while ever changing, are constantly recurrent. Today there is a large and almost daily increasing number of industrial concerns who base their program for future activity upon the reports of economists. The business history of the last two years is the history of distress and failure of the manufacturers and wholesalers who plan from day to day; a history of success and increased business for those who knew and followed the invariable pendulum swing of the business cycle.

Commander Karker's brilliant article in January PROCEEDINGS stressed the importance of seasonal buying of dry provisions and tinned fruits and vegetables. In this one item knowledge of the proper time to buy *next year* saves the navy thousands of dollars annually; and yet provisions are but one comparatively small group of the navy's commercial activities. The standard stock catalogue alone lists over thirty thousand items. The standard stock catalogue itself is the product of theory well digested, for each item included therein represents careful standardization of probably ten or more sizes and patterns previously bought retail at full retail prices.

Store keeping at navy yards is a vastly greater thing than the mere placing of stock on the shelves plainly marked and accessible for issue. A balanced stock can be attained only by accident unless its need is foreseen, its amounts ascertained by careful comparison of past activity and future policy and its procurement timed to hit the bottom of the market. Through the painstaking study and self-education of some of the senior officers of the supply corps, the purchase and supply of the navy has become nationally known and respected; and business in general is now counting on the navy both as a safety valve and an index. Business knows that the navy buys at the bottom and the navy purchases are frequently sufficient to check a disastrous tumble after the sane normal bottom has been reached, amounting as they do to hundreds of millions of dollars annually.

On many occasions the navy has been required to handle the financial affairs of foreign countries; and at such times invariably the fiscal and currency problems involved have been aggravated

by revolution, inefficiency and speculation to an extreme degree. Knowledge of finance, taxation and revenue, banking and currency are demanded; and here a mistake in judgment causes distress to an entire people. The currency and exchange problems of Haiti, for example, were called insoluble by civilian experts, yet Captain Conrad was able to help Admiral Caperton solve them. In the future, such problems are bound to appear again; and only by knowledge and preparation in advance can the business corps of the navy prevent criticism of naval administration and serious loss to the people concerned.

Up to the beginning of the world war the individual effort of ambitious officers of the supply corps raised navy business to this level and held it there. War multiplied navy business, increased navy demand both in volume and variety, depleted the number of officers who were masters of their profession, and brought into the corps a large number of juniors who, although practical men, were mostly without comprehension of the fundamentals upon which their profession stands. The officers of the corps commissioned since 1916 outnumber those commissioned prior to 1916; and at this time the present standard of navy business demands that not half but all know the theories and fundamentals which shape the navy's business policy. The Supply Corps School of Application is for the purpose of indoctrinating these officers.

The first class of twenty-five officers was convened July 11 and was graduated October 29. This seems an excessively short period of time. However, in the schoolroom itself, seven actual hours per day are put in and two hours of reading are required at night. In addition the student must spend still further time arranging and classifying his lecture notes in collateral reading and in preparing a thesis on an assigned subject. A fair estimated average of the applied time of each student during the course is a thousand hours—the known minimum is nearly eight hundred hours.

Viewed on the basis of hours, the school's program is still a remarkably ambitious one. The definition of logistics—"that branch of military science embracing preparation for war and including all details of supply and transport up to actual battle"—is a statement of enormous scope. Back of accounting, purchase, supply, clothing, and commissary, must come office and plant

management; back of disbursing must come banking and finance; back of transfer of men and commodities must come railway traffic and ocean transportation in all their legal and technical phases. And still further back of them all must come an understanding of business cycles and economics in its broadest sense. Naturally anything like a complete review, even in the most condensed form is impossible in one thousand hours. But it is possible to teach fundamentals, to renew habits of study and to create an enthusiasm and desire to keep on which will inspire each officer to continued study along sound and necessary lines.

Such concentrated instruction cannot be hastily prepared if it is to be of value. Foremost among our tools are those marvels of studious concentration—The Alexander Hamilton texts. In addition a carefully selected library is slowly growing. The great asset of the school, however, is the caliber of the lecturers from outside the navy who have heartily assisted and are giving us of their best. The twenty-six lectures of the course in banking are written and delivered by presidents and officers of a dozen leading banks. Foreign commerce and transportation have been treated by railway officials, steamship company presidents, officers of the Pan-American Union and university professors. Teachers who are nationally and internationally known have contributed to make the school a success, such men as Dean Wallace B. Donham, of the Harvard Graduate School, Dr. C. W. Gerstenberg, of New York University, Dr. Jacob H. Hollander, of Johns Hopkins, Dr. Roy S. MacElwee, of Georgetown University, Dr. James Brown Scott, president of the American Society of International Law, and Dr. L. S. Rowe, of the Pan-American Union.

Broadly speaking, the course has been divided into three major subjects which run simultaneously through the entire period of lectures. Accounting is, of course, the first, and twenty hours are spent in lecture and laboratory work under the direction of Mr. John Berg, B. C. S., M. C. S., C. P. A., a member of the faculty of the Washington School of Accountancy. From this as a basis, officers and civilians, who have built up the navy's accounting system, extend the instruction along naval lines of title and appropriation accounting, cost finding and cost inspection. The second fundamental is banking. The base course is arranged

by President V. B. Deyber, Second National Bank; Mr. Howard Moran and Mr. A. C. Flather, American Security and Trust Co.; Mr. Edward McQuade of the Liberty National; Mr. Joshua Evans, Jr., and Mr. Robert Fleming of Riggs National; Mr. Chas. Boyer, of the Federal National; Mr. F. G. Addison, of Security Savings; Mr. E. H. Thomson, of Washington Loan and Trust, and many others. From this series of twenty-six lectures covering banking fundamentals grow a number of branches by bureau officials, collateral reading and talks by authorities on foreign exchange. The third major subject, transportation, extends from the actual shipping papers back to the legal precedents which require their use. Particular attention is, of course, devoted to military transportation requirements in peace or war both afloat and on the beach. Behind these three majors and linking them together there is a continuous study of economics and the fundamentals of finance.

At the end of the course in addition to submitting his thesis each student has visited and thoroughly inspected the activities of the navy yard, the Bureau of Supplies and Accounts, Comptroller's office, Veteran's Bureau, a meat packing plant, at least one bank in the District of Columbia and the office of an investment company. In addition, his Saturday afternoons have been employed in inspecting the public buildings, historical monuments, libraries and art galleries of the Capital.

Altogether the course is no child's play, but it has been tackled with enthusiasm, and it is getting results. These results in the way of economy and business and military efficiency to the navy are not transient things; and the future benefits to the navy business and reduction of costs will be almost limitless.



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## MAINTAINING YOUTH IN SERVICE

BY WALTER AAMOLD

*Department of Physical Training, U. S. Naval Academy*

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Strange enough—it was a mariner, Ponce de Leon, who first worked up the idea of maintaining youth beyond the gay fleeting years that pass only too quickly.

Centuries before daring seamen had set out in search of the “Golden Fleece,” a short cut to wealth; and in later years Cortez, in a less romantic way, actually laid hands upon such a fortune—but it remained for Senor de Leon to show the way to a greater wealth, and perhaps men are now just beginning to get a practical grip on the “atomites” that cause early age.

There must have been many a gray-haired champion of old Spain who each day tottered to the edge of the sea to lean upon a gnarly cane and search the horizon for the return of the white winged ships of hope. But like many a pioneer, Ponce never came back. However, his idea nestled dangerously close to the human heart and the old mariner’s sincerity clinched a hope for time and a day—eternal youth!

Science following upon the wake of this illusionary leader has found the right spring, and a number of fundamental laws of life have been brought to the surface since 1512. The fountain of youth can be made to bubble just a little longer in the lives of men who are sincere and who hold to the rules set before them.

Now, so long as an officer may look ahead to “foggy” pay, there is some incentive for his wanting to live up to the full limit of its application—and, with a ten-year naval holiday in addition, it may be necessary for an ensign to put off old age indefinitely in order to have strength enough to grip his commission as lieutenant when it is presented him.

*Man's March Across the Horizon.*—A man's physical age is divided into two distinct periods: the "age of elasticity" and the "connective tissue age." Between the two there is a twilight period of variable duration, dependent upon individual characteristics. Likewise, there are two mental ages: "age of daring" and "age of conservativeness" with wind and water between.

A "connective-tissue mind" anchored to an "elastic" body arrests development to both. There are many unfortunate combinations between mind and body, and of course there are some very beneficial combinations as well.

*Reversal of Conditions Afloat.*—Experts have stereotyped into every language except the one that reaches a man's disciplinary conscience, that exercise is essential to elasticity. Ah!—That same old story about exercise!! Humble as it is, fifteen minutes of exercise daily—goes begging.

This short period will perform two of the wonders Ponce sought—for it maintains elasticity and eliminates the factors of deposit that turn lithe muscles into stiff, shortened, dried-out fibers of the body. Exercise preserves the essentials of youth—elasticity, suppleness, tone; the foundations of grace, energy, and physical ambition. The hope, like a mariner's morning, could not be more rosy!

Officers are able to talk for hours on the life of a gun or the elasticity of steel, but in these absorbing interests do they give thought to the life of elastic usefulness that is their part in the service?

Duty afloat seems to reverse the factors of age. A careful analysis will show that conditions which age the civilian are the very ones that maintain an officer's youth.

Where a civilian drinks polluted well water, alkali combinations not fit for washing the boiler of a tug, or city water saturated with chlorine, the service has at its disposal (minus submarines and certain destroyers) properly distilled water. This comparison may be continued through air, food, sunlight—the balance always favors the officer. But—on the port hand, an officer is on duty always, his hours are made irregular by years of night watches, he is exposed to weather just as "she blows" when at sea, he is kept mentally alert for unusually long periods as commanding officer, navigator, and in the many other divisions of authority



which carry direct responsibility. And, it must be admitted, too, that by virtue of an officer's social position in the nation, and the sliding scale of pay, he is often brought face to face with trying financial conditions that have no equal for bringing on gray hair.

On land a civilian stretches his legs in his daily efforts—he has clubs, golf links, recreation centers, theatres and most important of all, a home to sweep away the grit from his bread and butter.

An officer in active service sleeps and eats with his profession, and is forced to receive his domestic heritage in a weekly letter from home.

On graduation an officer enters sea service with a constitution that is as solid as the foundations of a turret; attached to his commission, however, is a little joker. Up to the day of graduation he has been a "land lubber" despite his summer cruises, and his mind is set in a land-locked way.

Graduation sends him to sea in an element only natural to fish, and he is forced to live within the covers of the regulations and pay table. The habits of *relaxing, exercising, playing*, are replaced by a continual alertness, very often somewhat strained; confinement and a somber dignity essential to discipline.

What has been stated is not in any way a criticism—it is but a brief outline of conditions as an officer faces them. Many of the conditions are necessary to service, and for these the nearest counter measures must be found.

Three rules may now be given:

*Fifteen minutes of exercise each day.*

*Definite periods of relaxation.*

*An energetic, youthful frame of mind.*

When a captain feels that he can no longer exercise at all, play golf, go hunting, or completely relax from his duties, he has become a "fixed star" and he has grown mentally old at least. If his muscles are becoming rigid, his joints stiff, eyes dim, and his carriage is settling like the keel of his ship, he is on the road to a physical old age and heroic measures are necessary.

Emerson has said that a field cannot be seen from within the field. Neither may a man see that he is growing aloof from the things which keep him young; for example an occasional dance,

light banter at the table, a good night's sleep, an efficient day of work, and perhaps a game of golf or hand-ball. The morning "growl," noon "fatigue" and evening pains of "gout" are the three Furies of old age.

Fortunately, Nature in her wisdom allows faults that have extended over years to be corrected, and nothing can be more beneficial than a correct frame of mind and moderate exercise. The subject of re-building is too long to be given here, since this treats with a difficult enough subject as it is; however, a brief outline of beneficial measures, extracted from a previous article, is included herein as being directly necessary to maintaining physical fitness and mental youth.

Recent tests on officers in the postgraduate department gave evidence that officers in general suffer marked loss of strength after graduation, particularly in the largest and least actively employed muscles, with greatest defect in neck and trunk.

Not only was there a loss of actual contractile power (forerunner of connective-tissue age) but also a loss of the ability to apply muscles to their full efficiency (loss of tone). In addition to loss of muscular strength, there was a loss of *habit* of using these muscles which implies a loss of "form" and co-ordination. The conclusions to be drawn are self-evident: only by daily, well-regulated exercise can the personnel maintain a good standard of muscular strength and bodily efficiency.

*Forms of Exercise.*—The daily program of exercise should be greatly varied. In the case of the man of middle age, whose heart, lungs and muscles have habituated themselves to a certain range and rhythm, there must be reasonable care, not so much in the kind of exercise indulged in, but rather in the strain involved and duration of strain.

*All-Around Participation.*—It is better to become interested in an all-around group of sports and exercises than to specialize in one particular branch. The man who concentrates on one subject is very apt to become engrossed in its competitive features and the worry of winning and depression of defeat often become factors which destroy the benefits of the exercise.

*Over-Fatigue and Normal Fatigue.*—Fatigue which lasts beyond the next day, or which brings about a rise in temperature and bodily discomfort has been excessive. If it is localized in the

muscles used and passes away by the next morning, it is to be encouraged.

*Rope Skipping.*—This exercise is for developing the arms, legs, lungs and trunk muscles and is excellent in bringing about good co-ordination. Skip three one-minute rounds. Always skip on the toes and vary the footwork as desired.

*Relaxation Exercises.*—Stretching exercises and exercises in which the movements are free, aid in developing and overcome the stiffening and shortening of muscles, a condition often known as "being muscle bound." Hang free from the deck, swing trunk and legs; then stand on deck and swing arms loosely, twisting shoulders, head and trunk without resistance. All relaxed moves are excellent for keeping the body supple.

*Medicine Ball.*—Throwing the medicine ball develops the muscles of the back, shoulders and arms, and is excellent in relieving constipation. Throw ball from various positions for three rounds of two minutes each.

*Posture.*—There is a natural tendency to laziness of posture in standing and walking which can only be overcome by a determination to live up strictly to the best form and to give constant attention to corrective measures. The average posture is faulty, and an ideal posture can not be obtained without careful training and discipline.

A faulty posture brings about pressure against the base of the brain, throws the vital organs out of position and permits a weakening of trunk muscles to a serious extent. The most noticeable faults are: drooping head, neck bent forward, unequal shoulders, rounded upper back with exaggerated dorsal curve (kyphosis), compensated lumbar curve to offset upper curve (lordosis), possibly lateral curvature of spine, hips drooped forward, protruding abdomen, flat feet, and most frequent of all errors—*flat chest*.

*Corrective Exercises.*—Constant attention to correcting parts out of line. Deep breathing combined with an effort at chest lifting. Add arms raising forward and upward during inhalation, sideways and downward during exhalation.

*Mental Exercises.*—Mental relaxation for at least an hour each day. Change point of interest by taking part in golf, hunting,

fishing, winter sports, or an avocation that demands full attention of the mind for a short period each day.

Above all there must be the same faith that inspired Ponce de Leon to cross the world for the ideal he sought.

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## APPROACH OMNIMETER

BY LIEUT. COMMANDER S. E. BRAY, U. S. NAVY

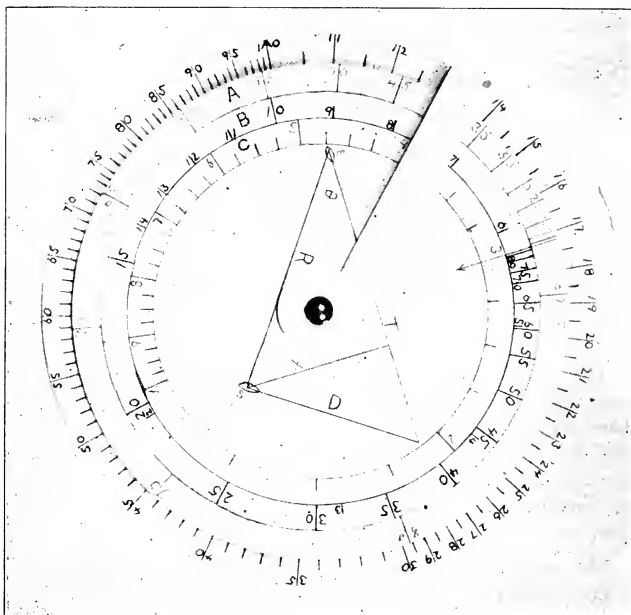
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### CONSTRUCTION

The instrument consists of two discs and a pointer. The outer or larger disc is constructed by laying off the logs of numbers from one to one hundred around the circumference of the disc. Thus, if the disc is ten inches in circumference, number 2 would be laid off 3.0103 (log) inches from the zero point, etc., number 3 would be laid off 4.7712 (log) inches from the zero point, etc.

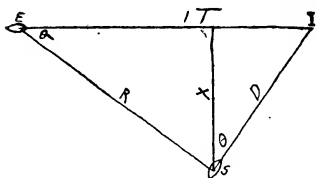
The inner disc has three scales, the outer two of which are degree scales and the inner a time scale. The red scale of degrees is laid off by looking up the log cosines of angles for every  $5^{\circ}$  from  $0^{\circ}$  to  $90^{\circ}$  and plotting the line opposite the amount indicated on the outer disc scale. The black degree scale is similarly plotted but taking the log cosecants as factors. The time scale is laid off by dividing 3 by different times from one minute to ten at 15 second intervals. Thus,  $3 \div 1 = 3$ , so one would be laid off opposite 3 on outer disc;  $3 \div 2 = 1.5$ , so two would be laid off opposite 1.5 on the outer disc and three opposite one, etc.

The instrument adds and subtracts logs automatically or in other words multiplies and divides numbers. Thus, to divide 10,000 by  $\cos 30^{\circ}$  place red  $30^{\circ}$  under 10,000 and read off 11,600 opposite the arrow. Therefore to divide always place dividend and divisor in coincidence and read opposite the arrow. To multiply 10,000 by  $\cos 30^{\circ}$ , place arrow under 10,000 and read off opposite red  $30^{\circ}$ . Therefore to multiply place red arrow under number and read off opposite the degree mark used.



A=Red Circle  
B=Black Circle  
C=Time Circle

### THEORY



### THEORY

Considering the approach triangle  
ESI a right triangle with,  
R=Unity=Range  
T=Distance enemy must run.  
D=Distance sub must run.  
X=Shortest distance to enemy  
track.

$\theta$ =Angle on the bow.

$\cos \theta = R \div T$ ,  $T = R \div \cos \theta$ ;  $\sin \theta = D \div T$ ,  $\sin \theta T = D$ . But  $\sin \theta = 1 \div \csc \theta$ . Therefore  $D = T \div \csc \theta$ ;  $\cos \theta = X \div D$ ,  $\cos \theta D = X$ .

# OPERATION

To find "R"

- (a) Nautical eye.
- (b) Range finder.
- (c) Telemeter scale.

The first and second methods require no comment. Range is found by the third method as follows:

After setting enemy abeam (or before) estimate what type of ship it is. Knowing the type, the length will be known within very close limits as ships in all navies are approximately of the same lengths taking them type for type. Then estimate the angle on the bow  $\theta$  and also take the number of degrees the enemy subtends on horizontal telemeter scale. If you are not abeam of the enemy you cannot see all of his length, that is the total length of the enemy will not be projected on the telemeter scale. So the telemeter reading must be multiplied by a number depending on the value of  $\theta$ . To obtain this number put the zero lines of both discs in coincidence and place pointer over black mark agreeing with estimated angle on the bow. The multiplier is picked off the outer disc under the pointer.

For example suppose the C. O. estimates the enemy to be a modern battleship, he knows then that her length is about 600 feet. Angle on the bow estimated to be  $30^\circ$  and enemy subtending 1.2 on the telemeter scale. Place zero lines of discs in coincidence. Place pointer over black  $30^\circ$  and it points to 2. Multiply 1.2 by 2 and get 2.4, the number of degrees the enemy would subtend were you on her beam. Look up range in table. In this case 10,000 yards.

LOW POWER 1.5, 25 feet  $\approx 1^\circ$  at 1,000 yards.

Enemy Length	RANGE									
	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
250	10	5	3.3							
300	12	6								
350	14	7								
400	16	8								
450	18	9								
500	20	10								

Enemy Length	RANGE									
	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
550	22	11								
600	24	12	8	6	4.8	4	3.4	3	2.66	2.4
650										
700										

(Table should be made out for 50 ft.=1° at 1,000 yds., but it serves for this illustration.)

To find T=Distance enemy must run.

Place red 30° under 10,000 and read 11,600 on the outer disc opposite arrow on inner disc.

To find D=Distance submarine must run.

Place black 30° under 11,600 on the outer disc and read 5,775 opposite arrow on the inner disc.

To find X=Shortest distance to enemy's track.

Hold arrow on 5,775 and read off opposite red 30°, 5,000 on outer disc.

#### SPEED

1. To find the speed the enemy must take to stay abeam of the submarine, place the arrow under the speed of submarine, on outer disc and read off opposite the angle on the bow black angle. Thus, if the submarine is making 9 knots and angle © being 30°, place arrow under 90 on the outer disc and read off opposite 30° and you will get 18 knots.

2. To find speed if enemy draws ahead or astern.

Method "A"—using red angles only.

Factors used in this method are as follows:

1. Time interval between ranges (known).
2. Change in enemy bearing (known).
3. First and second ranges (approximate).
4. Angle on the bow (estimated).

So far the following data has been used:

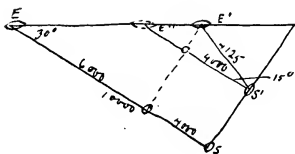
Angle on the bow 30°

Range 10,000 yards

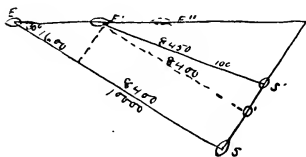
Submarine speed 9 knots

and it will be used throughout this explanation. Also the time interval will be taken as 8 minutes.





for angle on the bow has increased  $15^\circ$ ). If enemy had maintained an intersecting speed he would have been at  $E''$  but he is really at  $E'$ . Angle  $E'S'E'' = 15^\circ$ . Place arrow under 4,125 yds. and read off 4,000 yds. opposite red  $15^\circ$  equal to  $S'O$ . Subtract this from 10,000 getting  $EO' = 6,000$  yds. Place red  $30^\circ$  under 6,000 and read off 25.95 knots opposite 8 minute mark on time scale.



#### ENEMY DRAWS ASTERN

If enemy draws astern the procedure is the same. Enemy draws astern  $10^\circ$ , range 8,450 yds. (use  $20^\circ$  in finding multiplier). Place arrow on 8,450 and read 8,400 opposite red  $10^\circ$  mark  $= EO'$ . Place red  $30^\circ$  under 1,600 and read 6.95 knots equal enemy speed opposite the 8 minute mark.

### 3. Method "B"—using black angles only.

The following factors are used:

1. Time interval between observations (known).
2. Increase or decrease bearing (known).
3. Range at second observation (approximate).
4. Angle on the bow (estimated).
5. Submarine average speed during interval (?)



angle on the bow. If angle on bow is  $30^\circ$ , and submarine speed is 9 knots, the enemy would need to make 17.6 to maintain the original bearing constant. If enemy is  $20^\circ$  forward or abaft of submarines beam black  $70^\circ$  would be placed under submarines speed, etc.

To find speed of enemy if he draws ahead or astern. First find enemy's speed to maintain constant the original bearing as explained in the above paragraph. Find  $E'' E'$  as in method "B" and add or subtract from 17.6 as the case might be.

The approach omnimeter will aid the navigator of a submarine or other vessel when it is desired to pass a certain object at a given distance abeam. Suppose for instance, that the captain of a vessel coming into port wishes to pass the end of a dock at a distance of two hundred yards on his port hand vessel on course  $0^\circ$  dock bearing  $20^\circ$  on the port bow. Take range with range finder and at same time observe relative bearing. Suppose range 14,000 yards and bearing now  $25^\circ$  on port bow. Place red arrow of inner disc under 14,000 and read under 200,  $82^\circ$  on red circle.\* Take complement of  $82^\circ$  which is  $8^\circ$ . Therefore the relative bearing of the dock at the time of taking range should be  $8^\circ$  in order to pass dock abeam distant 200 yards. Hence course will be changed  $17^\circ$  to left immediately and the same operation gone through again until the relative bearing of dock agrees with bearing obtained from omnimeter.

The writer during short range battle practice of the *Charleston*, spring, 1921, used this method entirely in making approaches for each run. He took his station at the standard compass and had direct communication with the range finder. All his attention was given to maneuvering the ship and seeing proper signals given for commence and cease firing. During the whole practice it was unnecessary to take a pencil or manipulate a parallel ruler. After inspecting the target we would stand down astern for about 2,600 yards and then turn to course paralleling the targets bringing target on the side from which we were to fire. A simultaneous range and relative bearing would be taken and this bearing checked with the bearing obtained from the omnimeter. We endeavored to pass target abeam distant 1,600 yards. Suppose first range was 2,800 bearing  $25^\circ$  port. Place red arrow under 2,800 and pick out under 1,600  $55^\circ$ .  $90^\circ - 55^\circ = 35^\circ$ . Therefore

$35^{\circ}$  is what target should bear at this range in order to pass it on parallel course at 1,600 yards range. The observed bearing was  $25^{\circ}$  so the ship is inside  $10^{\circ}$  and it will be necessary to sheer off to the right. To find distance inside place black  $25^{\circ}$  under 2,800 and read 1,180 under red arrow.  $1,600 - 1,180 = 420$  yards.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

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## A PROGRAM FOR NAVAL HISTORY

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### LIST OF WORKS AND ARTICLES CONSULTED

#### I. *Naval and Military Essays—Cambridge Naval and Military Series:*

1. Corbett, Staff Histories.
2. Hale, The Difficulties Encountered in Compiling Military History.
3. Maurice, The Value of the Study of Military History as Training for Command in War.

#### II. *American Historical Review:*

1. January, 1921: A Caution Regarding Military Documents.
2. July, 1919: Magoffin, Historical Work by General Staffs.
3. July, 1919: Taylor, The History of the War of 1917.
4. October, 1912: Leland, The National Archives; A Program.
5. April, 1911, July, 1911: "A British Officer," The Literature of the Russo-Japanese War.
6. January, 1907: "A British Officer," The Literature of the South African War.

#### III. *Journal of Royal United Service Institution:*

1. August, 1921: Dewar, The Necessity for the Compilation of a Naval Staff History.

2. August, 1921: Sturdee (a discussion of the preceding).

IV. Langlois and Seignobos, *Introduction to the Study of History*. New York, Henry Holt and Co., 2nd Edition.

V. Various Official Histories and other Official Military and Naval Publications in the Library of the U. S. Naval War College.

In view of the traditional military policy of these United States to neglect preparation against the coming of war and in times of peace to starve the military and naval establishments, there is little that the navy department or the war department can do toward securing a high degree of military efficiency. But there is one precaution that can be taken, and that is one of supreme importance; to raise the standards of leadership to the highest possible degree of excellence. In securing this, no factor is of such fundamental importance as an intelligent use of history.

The value of military history is no longer a matter of controversy; that value is now universally recognized and its standing is established. But we cannot get the most out of history unless all its various uses are clearly understood and a definite policy for its fullest exploitation is adopted. It is proposed here to set forth these various employments, to describe briefly the development of staff histories, to describe the types, methods and sources and to suggest a policy whereby the most effective use can be made of our historical sections.

It was nearly a century ago that the value of staff histories was first recognized when, from 1824 to 1847, officers of the Russian general staff published an official history of the Seven Years' War.<sup>1</sup>

Magoffin gives as the next steps a *History of the Operations of 1812* by the Russian General Staff<sup>2</sup> and the campaign of 1859 in Italy by the *Dépôt de la Guerre*, published in 1860. However, if the latter be considered a staff history, it is only fair to accept as the second step the *History of the Campaigns of the Emperor*

<sup>1</sup> *Geschichte des Sieben Jahrigen Krieges, von den Offizieren des Grossen Generalstabes*. See Magoffin, "Historical Work of General Staffs" in the *American Historical Review*, July, 1919. Mr. Magoffin's footnotes form the basis of a valuable bibliography of staff histories.

<sup>2</sup> M. Bogdanovich, *Geschichte des Feldzuges im Jahre 1812, nach dem Zuverlässigsten Quellen, auf Allerhöchsten Befehl*.

*Napoléon, 1805-1809*, published as a "Mémorial" 1843 by the *Dépôt Général de la Guerre*.<sup>3</sup>

But the modern staff history had its origin with the appearance of the campaign of 1866 in Germany and the Franco-German war, both by the military history section of the Prussian great general staff<sup>4</sup>, and the Golden Age of staff histories was in the decade preceding the world war when such wars as that in South Africa and the Russo-Japanese war were fully described by all such staffs as had historical sections, and accounts and criticisms of previous wars were published also. The foremost historical sections were: The military history section of the Prussian great general staff<sup>5</sup>; the historical section of the general staff of the French army<sup>6</sup>; the Military Commission of the imperial Russian supreme staff<sup>7</sup>; and the historical section, committee of imperial defense in Great Britain. The Esher committee failed to establish an historical section in 1904. However, in 1908 this duty, together with that of writing naval staff histories, was given to the C. I. D.

A comparative study of the methods in various countries together with a study of present developments and tendencies will enable us to profit by the experience of others. The most noteworthy departure was the German practice of publishing monographs. This example is now very general. Another method of work is that followed by the British in producing an official history of the war in South Africa: it was written "by direction of his Majesty's Government" by the distinguished military historian, Major General Sir Frederick Maurice. In France a similar practice has long been very common: *Redigé sous la direction de l'État—Major de l'Armée, 2<sup>e</sup> Bureau* or *Publié sous la direction de la Section Historique*.<sup>8</sup>

<sup>3</sup>*Histoire des Campagnes de l'Empereur Napoléon, 1805-1809; Mémorial du Dépôt Général de la Guerre, 1843.*

<sup>4</sup>*Der Feldzug von 1866 in Deutschland; Der Deutsch—Französische Krieg, redigiert von der Kriegsgeschichtlichen Abteilung des Grossen Generalstabes.*

<sup>5</sup>*Kriegsgeschichtliche Abteilung Grossen Generalstabes.*

<sup>6</sup>*Section Historique de l'État—Major de l'Armée.*

<sup>7</sup>*Kriegsgeschichtliche Commission des Kais—Russischen Hauptstabes.*

<sup>8</sup>Examples are:

Colonel Desbrière's *Projets et tentatives de débarquement aux îles Britanniques, 1798-1805*; de la Jonquière's *L'Expédition d'Égypte, 1798-1801*; Balaguy's *Campagne de l'Empereur Napoléon en Espagne, 1808-1809*.

A third interesting development was the beginning of a combined military and naval official history of the Russo-Japanese war by the committee of imperial defence.<sup>9</sup> This was begun by the general staff, war office, as a military history and Volume I was published as such. However, beginning with Volume II it continued as a combined naval and military account.

Such were the tendencies before the war; how were they represented in our own country? The answer is, of course, that they were not represented at all. To parody the famous words of John J. Jones: "We had not yet begun to write."

While other states were producing staff histories the military literature of the British and the Americans had types all their own. For just as our cousins adhere to the system of refusing to prepare beforehand against war so as to forestall failure, and prefer to investigate afterwards into the causes of failures, so also do we. It would be as humiliating as it would be tiresome to give a long list of examples of the resulting literature; a few will suffice to indicate the type of material referred to.

*The Report of his Majesty's Commissioners appointed to inquire into the Military Preparations and other Matters Connected with the War in South Africa; The Report of the Commission appointed by the President to Investigate the Conduct of the War Department in the War with Spain; The Report of the Dardanelles Commission, and the Report of the Senate Naval Investigating Committee.* Nor must it be imagined that this kind of material is useless; it has at least one very great value: it supplies copious accumulations of information from which innumerable books may be written on "How not to conduct war."

During the period when the wicked general staffs were producing their "militaristic" literature, with our customary virtue we were engaged in publishing our own military records in such a manner as to render them useless for any warlike purpose. The *Records of the War of the Rebellion* were printed at a monumental cost. What could have been and should have been a priceless collection was turned into an abortive effort because the publication being a political maneuver and not a scholarly or a

<sup>9</sup> *Official History of the Russo-Japanese War (Naval and Military) prepared by the Historical Section of the Committee of Imperial Defence, London, H. M. Stationery Office, 1910.*



military undertaking, was entrusted neither to scholars nor to military men, but political appointees. The manner in which such things are done by our government is in exasperating and pathetic contrast with the intelligent methods of any other state. One of our collections bears this notice:

"Edited by the Clerk of the Joint Committee on Printing."

All the eloquence of a Webster, a Burke, a Cicero, a Demosthenes or of a Blanton could not more completely damn our methods than that one simple inscription. Governments knew better than that before the first Pharaoh. Unofficial military history was in almost as ludicrous a state. Comparable in futility with the *Records of the War of the Rebellion* are the ponderous labors of Colonel Dodge—worse than useless: historically false.

However, we have improved. But even the British preceded us. In 1884, before they had a general staff the quartermaster general's department published *British Minor Expeditions*. About 1901 our military intelligence department of the adjutant general's office published an account of the *Military Operations in South Africa and China*. Then came the British official history. After the Russo-Japanese war the war office printed *Reports from British Observers Attached to the Japanese and Russian Forces in the Field*. This was an account of military operations. Our own *Reports of Military Observers Attached to the Armies in Manchuria during the Russo-Japanese War* while not strictly military history, contained valuable material, especially on arms, equipment, organizations, etc.

About this time the navy department became dimly aware that there was something called naval history, and O. N. I. published *Notes on the Spanish-American War* while the bureau of navigation issued *Naval Operations of the War with Spain*. These are valuable mainly because they indicate a beginning. They do not compare with the *Naval Operations of the Russo-Japanese War* by the Japanese naval staff.<sup>10</sup> On the other hand, the British began their official history by the committee of imperial

<sup>10</sup> *Opérations Maritimes de la Guerre Russo-Japonaise, Historique Officiel publié par l'État—Major Général de la Marine Japonaise, traduite par Paul Monconduit Enseigne de Vaisseau, Paris, R. Chapelot, 1911.*

defence and the Japanese naval historical section had published 130 volumes on the Russo-Japanese War.<sup>11</sup>

Since the world war activity has begun once more in the historical sections. In Germany the *Admiralstab* is preparing a naval staff history under the superintendent of the marine archives. It is to include five sections as follows:

1. War in the North Sea.
2. War in the Baltic Sea.
3. War in the Black Sea.
4. Cruiser Warfare.
5. Submarine Warfare.

In France the naval history section, which was organized in the bureau of operations in 1910, had been absorbed. By a décret of July 19, 1919, a new historical section of four bureaux was established under the direction of Captain Castex.

In the British admiralty, immediately upon the outbreak of the world war, on August 4, 1914, the naval history section was organized.<sup>12</sup>

Sir William Slade and Sir Julian Corbett were asked to take charge. They were given about ten officers and a large force of clerks and an entire building was set apart for their use. There, copies of all reports were sent. These were studied and from them an account of the operation written. Galley-proofs were sent for criticism to those concerned and the result formed the basis of the official narrative. Of so much importance did the British regard military and naval history, and thus intelligently did they go about its preparation.

So too, when General Pershing set up his headquarters at Chaumont, he had on his staff our most distinguished—our only distinguished—military historian, the late Professor R. M. Johnston. The historical section of our war plans division, general staff today, has cause to bless him, and work there is proceeding on intelligent lines. And similarly, when war was declared, Admiral Sims in London had not failed to recognize the necessity of a complete record of our naval activities, nor had he failed

<sup>11</sup> Captain Alfred Dewar, O. B. E., R. N. (retired), B.Litt. (Oxon). "The Necessity for the Compilation of a Naval Staff History," in the *Journal of the Royal United Service Institution*, August, 1921.

<sup>12</sup> Admiral Sir F. C. Sturdee, R. N., in the *Journal of the Royal United Service Institution*, August, 1921, page 382.

to note the efficiency of the admiralty historical organization. He submitted a complete report and strongly urged that an analogous organization under a trained and competent historian be started in Washington. No action was taken upon this recommendation. It was repeated some months later with the result that permission was granted that such a section be established in London. This was done at once. Captain Knox was placed in charge. His force grew to include thirteen officers and a hundred clerks. These went over a hundred file cases of four drawers each, selecting, classifying and cataloguing materials. Twenty cases of classified and completely indexed documents were sent to the navy department. The full significance of this work can be appreciated only by a historian.

To digress, to point a moral and to adorn a tale, to show how, sometimes, virtue is rewarded even in this world, it was this scientific arrangement of material that enabled Admiral Sims, during the senate naval investigation, to put his hands immediately upon any desired document to substantiate his statements and to prove his contentions; this to the surprise and to the confusion of his enemies, while the files of the department were in chaos.

The use to which the materials thus variously collected have been put forms an interesting contrast. Sir Julian Corbett has published "by direction" of the admiralty two volumes, admirable in all respects except that he does not and cannot quote his sources; for the admiralty still holds many documents confidential and disclaims any official responsibility for Corbett's statements. Our general staff historical section has projected a very intelligent arrangement:

1. General Military History of the War.
2. Diplomatic Relations.
3. Economic Mobilization.
4. Military Mobilization and Supply.
5. Military Operations.
6. Military Occupation.

The first two volumes have already appeared. These are: *Field Orders, 1918, 5th Division* and *Field Orders, 2nd Army Corps*. Very wisely the publication begins with group five and there are no comments. This is quite sound. However, in ad-

dition to these short tactical studies have appeared such as: *Monograph No. 4, A Study in Troop Frontage*. The naval historical section has also produced two monographs: *Publication No. 1, German Submarine Activities on the Atlantic Coast of the United States and Canada*, and *Publication No. 2, The Northern Barrage and Other Mining Activities*. These are by no means admirable even for first efforts. Whatever other reasons there may be, this much is clear, that the result shows no precise conception of the rôles of military history; the volumes are designed to serve no definite purpose. This matter needs clearing up before proceeding further.

From Maurice, Corbett, Wilkinson, from our own Mahan, and from a host of others, we have come to concede universally the value of military and naval history. It is now the fashion to exalt its benefits. Corbett says:

The main question with regard to staff histories is no longer concerned with their value or purpose; it is concerned rather with the best means of producing them, the best means, that is, of getting from them the desired results.

This cannot be done until we have a definite idea of its benefits. But we do not yet differentiate distinctly between these benefits. Now there appear to be three general uses. The first is to give a broad perspective and to indicate the interrelation of the widely different phases of war. The second is through historical research to gain a wider experience. The third is through analysis to deduce a doctrine of war. Vision, instruction and doctrine; these are the main benefits of military history.

Captain Dewar says:<sup>13</sup>

Where then does the function of history come in? Its function is to stand aside from current business and give a clear exposition of events. . . .

The navy is a business which is only occasionally actually engaged in the performance of its business, and its business is of such a nature that the people doing it do not know what they are doing in its relationship to the whole. This they can only learn from history.

Captain Dewar then quoted from Admiral Vesey Hamilton's preface to his work on naval administration:

For myself, I learned more of the interior workings of the admiralty in the compilation of this volume than I did in five years at the admiralty.

<sup>13</sup> In J. R. U. S. I. quoted above.

This is the use of perspective and vision.

Sir Frederick Maurice expounds well another use:

We require, then, a wider knowledge of war than is obtainable from practical experience even by the most fortunate, and to obtain this wider knowledge we must go to the records of past war.<sup>14</sup>

This is the use of training and experience.

The third use is described by Corbett as:

. . . a mine of experience whence alone gold is to be found from which right doctrine—the soul of warfare—can be built up.

The first use yields its fruits to those who compile history, the second to those who study it, and the third is mainly designed for analysis by the staff. This is a generalization with reservations implied. One must not go too far.

Now, just as there are different uses, so also there are different types of military or naval history. There are two: the first is designed for the deduction of general doctrine for the conduct of war and the second for the deduction of tactical doctrine. These differ not only in use but in sources and methodology. The first is largely concerned with wars long past for the study of which materials from both sides and from neutral sources, and of all aspects, political, diplomatic, economic, logistic and strategic are ample. This gives a wide perspective and enables one to deduce general principles. For the study and preparation of this type, trained historians are to be preferred, because their knowledge of the general background is more detailed, their knowledge of sources is wider and because they possess critical skill and other technical advantages of their craft. Nevertheless, the advice and co-operation of military men is essential.

On the other hand, the second type requires a trained soldier or sailor to do the best work because it deals with technical details where the civilian would make many ludicrous mistakes. Even in a critical analysis of the documents a scholar trained in heuristic would be at a disadvantage, for he would know little of the conditions of fatigue, excitement, worry and fear under which many reports are often written.<sup>15</sup> Moreover the profes-

<sup>14</sup> The Japanese make a practical use of their naval historical section in this connection: The staff refers to it habitually for information regarding the class of operation projected. See in J. R. U. S. I. cited above.

<sup>15</sup> Historians recognize this disadvantage. See: "A Caution Regarding Military Documents" in the *American Historical Review*, January, 1921.

sional historian would hesitate to risk his reputation by dealing with a subject where materials are largely from one side only and where, even so, much is often perforce suppressed.<sup>16</sup> Then too the military man knows better what is desired: the search amongst the scanty documents of a recent war for indications of new tactical developments or future tendencies. But even so the trained historian or archivist could render effective aid and advice and by his knowledge of methodology save a tremendous amount of wasted time and effort.

In connection with this discussion of the types and uses of military and naval history it may be well to note a new development which broadens the scope of military history today. Modern warfare, the nations in arms idea pushed to its extreme application, necessitates the study of many new activities formerly only remotely related to war. In the United States a few of these subjects are described in popular volumes by private individuals. It is inferred from an interpellation in parliament that in Great Britain the government exercises some supervision over this work and that under its patronage and direction the following works are being prepared: by Mr. Ernest Fayle, a trade history; by Mr. Archibald Hurd, a history of the merchant navy; by Professor Sir Walter Raleigh, a history of the air forces, while Professor G. S. Gordon is writing on a military subject.

Now let us summarize the tendencies which are described above. In Great Britain a combined military and naval staff history has been published, and at present, not a merging but rather a close liaison and co-operation between military and naval historical sections has been urged.<sup>17</sup> In France staff histories are prepared by competent officers under the guidance of the historical section, while in Great Britain this patronage is extended to civilian historians, and, during the war, the civilian historians were placed in charge of all historical work. A further development is the present elaborate care exercised in the collection and clas-

<sup>16</sup> Military reputations are shielded or whitewashed and necessarily so, because leaders must be hedged about with prestige and confidence in them maintained. This is a factor of greater importance than military skill: "Unity . . . that first and supreme force of armies," as Ardant du Picq calls it, cannot be hazarded in the interests of mere tactical speculation.

<sup>17</sup> See Corbett in—*Naval and Military Essays, The Cambridge Naval and Military Series*.

sification of documents by historical sections, including our own. This is of supreme importance, and must be made a permanent practice. "No documents, no history," says the French scholar Langlois. In Germany this is so thoroughly recognized that the superintendent of the marine archives is a vice-admiral. Another tendency, urged in Great Britain and actually practiced in Japan, is the current use of military and naval history to check proposed operations. This practice in time of war will be invaluable. Finally the monograph has come to occupy a more definite place and to fill a distinct need. The monograph appears to be developing into a means for the speedy production of detailed accounts of specific types of operations for the practical current use of the Staff or for general instruction. These monographs can then form the basis of the general staff history. This would be a satisfactory solution of the problem whether a staff history should be published at once or whether to wait until all material can be utilized. Admiral Sir F. C. Sturdee, R. N., stated before the Royal United Service Institution:

I therefore think it very important that this history should be published for staff work as soon as possible, otherwise the experience will be lost. Of course it should be confidential.

The use of monographs could more quickly and better fulfill this function, would be handier, more widely available and deal with special phases. The general staff history could then be better prepared. This specialization is desirable from another point of view. It will be seen that the monograph method corresponds roughly to the type of military history concerned with the investigation of tactical tendencies, or at least lend itself readily to such a use; while the general staff history meets the requirements of a source for the deduction of general or strategic doctrine. We have observed also that in the former type the services of trained scholars is desirable and in the latter almost indispensable, and that there is a tendency to employ them there.

For some reason an attempt was made in 1919 by the navy department to secure the employment of trained scholars in the history section. Congress, however, attached a provision to the bill that no one should receive a salary exceeding \$1,800.00, which effectively disposed of that. There are numerous historians in this country who are—or who could easily be—interested in

naval history. But there is none who can afford, after having spent at least ten years in an expensive preparation, to accept a position at one-half the sum that an ordinary laborer regards as a minimum living wage.

In addition to historians, even more important perhaps, there is the necessity for trained archivists to classify, to catalogue and to care for the documents.

In this connection a writer in the *Historical American Review*<sup>18</sup> states:

The chief monument of the history of a nation is its archives, the preservation of which is recognized in all civilized countries as a natural and proper function of government. . . .

No government has expended larger sums of money for the purchase of historical papers . . . or made more lavish appropriations for the publication of documents (too often selected at random and ill edited) than the United States; and no government has more signally failed in the fundamental and far more imperative duty of preserving and rendering accessible to the student the first and foremost of all the sources of a nation's history, the national archives.

The answer is, of course, the trained archivist. Such an official could save incalculable wasted time and wasted effort on the part of officers. Says Captain Dewar:

The archival work was regarded as a subsidiary issue, whereas it was the converse that is true; it is the archival work that is of real importance; once that is done you can write as many histories in as many forms as you like.

Furthermore, the lack of knowledge of the existence or of the scope of sources deters many from undertaking historical work, and "There is no substitute for documents: no documents, no history."<sup>19</sup>

Mr. Leland quotes in his article on archives:

The care which a nation devotes to the preservation of the monuments of its past may serve as a true measure of the degree of civilization to which it has attained.

The inference is that the degree of care which a staff devotes

<sup>18</sup> Waldo Gifford Leland, "The National Archives," *American Historical Review*, Vol. 18, No. 1, October, 1912.

<sup>19</sup> Langlois and Seignobos, *Introduction to the Study of History*.



to its archives is an indication of its military efficiency. To sum up, it would seem:

1. No archivists, no documents.
2. "No documents, no history."
3. No history, no military scholarship—only scholasticism.

Moreover, if such skilled assistance could be authorized it would be a simple matter to publish a catalogue of documents to be sent to libraries and universities, and the knowledge of these sources would attract civilian scholarship to closer co-operation with the historical section.<sup>20</sup> This classification and cataloguing would enable our historical section to exchange non-confidential records with other historical sections and thus enable us to broaden our scope and to make valuable comparative studies.

Finally, as the preliminary step, to enlist the interest of individuals and to secure the co-operation of civilian scholarship, it is suggested that the navy department send an officially accredited delegate to the next meeting of the American Historical Association to confer regarding possible means of co-operation between our historians and the naval history section.

While it may be an impertinence, or at least an indiscretion to make any further suggestion, this much at least may be said, that the navy possesses able and distinguished officers of real scholarly ability such as to reflect prestige about them. They themselves may not think so. The writer has observed that our naval officers as a rule stand in great awe of scholarship and are frequently possessed of a modesty with regard to their own attainments. That is as engaging as it is unnecessary. Therefore they sometimes attain to considerable distinction along scholarly lines without themselves being aware of it. Wherefore it is possible today for the navy to delegate officers before whose distinction a gathering of historians would stand in respect.

<sup>20</sup> The following quotations from Mr. Leland's article are enlightening:

"Turning to the department of war . . . for years . . . no one not connected with the department has been permitted to have access to the records. . . . It has never been possible to know with exactness what the war archives comprise. . . ."

"In the navy department, where students have long received generous treatment, there is material which of late years is becoming better known."

Of course it has never been done before, but if it had, perhaps we could have produced some naval history by this time. Meanwhile the mantles of Admiral Mahan and of Theodore Roosevelt—one-time presidents of the American Historical Association—have grown dusty.

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## THE NAVY AND BUSINESS

AN ADDRESS BY ADMIRAL ROBERT E. COONTZ, CHIEF OF NAVAL  
OPERATIONS, TO THE NATIONAL ASSOCIATION OF  
MANUFACTURERS AT THE WALDORF, NEW  
YORK CITY, MAY 9, 1922

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The navy is today one of the government's biggest assets. The property value of the navy, that is, the value of the ships, shore stations, and supplies amounts to over \$3,000,000,000. This great asset belongs to the American people. The question of how to administer this organization is an important one. In conducting the affairs of any big business, is it a wise or a false economy to cut the operating and maintenance costs so as to cripple its efficiency? It seems hardly necessary to state that we must appropriate enough money to maintain and to operate the navy efficiently. In the case of the navy, as in the case of any business organization, ought we not spend enough on our investment to be able to meet our competitors, on at least equal terms? Otherwise, our organization may collapse and the money we expend be wasted.

Germany spent millions to build a navy 80 per cent as strong as the British. When war was declared in 1914, what happened? Germany was compelled to withdraw her fleet (excepting submarines) from the high seas. The great German merchant marine was forced to seek refuge in home ports or in the ports of neutral powers. British battleships, though anchored quietly at Scapa Flow, controlled the high seas. The British, having control of the seas, were thus able to rush to the western front troops from their distant possessions, from Australia, from New Zealand, from India, from South Africa, from Egypt, from Canada, and from the British Isles in the Carribean.

The greatest of naval writers, our own Mahan, has shown us in his books on the *Influence of Sea Power* that the nation controlling the seas has invariably won the war.

Clearly it seems a waste of money to have other than a 100 per cent fleet; a fleet able to meet any fleet in the world on at least equal terms.

The present Secretary of the Navy, Edwin Denby, has said:

Whatever armed forces have cost us, they have made and kept us a nation. When we can live without fire, police, and health protection, it will be time to discuss giving up the navy.

### WHY A NAVY

We should have a navy of sufficient strength to support our policies and our commerce, and to guard our continental and overseas possessions. Our foreign policies are as strong as our fleet and no stronger. President Grover Cleveland in a message in 1885, said this:

All must admit the importance of an effective navy to a nation like ours. A nation that cannot resist aggression is constantly exposed to it. Its foreign policy is of necessity weak, and its negotiations are conducted with disadvantage because it is not in condition to enforce the terms dictated by its sense of right and justice.

China is a nation of 400,000,000 people, but China is a shining example of an impotent nation, unable through the pitiful lack of an efficient navy to defend herself against foreign aggression.

Does not this helplessness of China have a distinct bearing on the reasons for calling the recent international conference in Washington? Never before has it been so apparent that the helplessness of a nation of great resources might be the cause of another world war. To all intents and purposes, China has naval disarmament. To those in America who advocate naval disarmament, let us point to the China of today.

### WHY WE BUILT OUR FIRST MEN-OF-WAR

When we were merely a British colony we had established a considerable export trade. Our people have always been inclined at the end of each war to "wreck the navy." At the conclusion of the war of the Revolution we "wrecked the navy" and disposed of every single ship. We even gave one ship to France, and in a

few years she was using it against us. We have at least partially profited by this experience, for now we scrap our ships instead of presenting them to possible future opponents. Shortly after we became an independent country and had wrecked our navy, the pirates of the Barbary Coast seized the wheat we had been shipping into the Mediterranean markets. Congress, to protect our trade, was, therefore, forced to make an appropriation to build fighting ships. So when the farmer in the great West asks why he should be taxed to build battleships, you can tell him that we built our first man-of-war in 1794 in order that his wheat could be safely delivered to foreign markets.

#### NAVY OPENS DOORS TO TRADE

The fact that Commodore Perry in 1854 opened the ports of Japan to the commerce of the world is so well-known that a review of this event is not necessary. However, the navy has done important work in the interests of our foreign commerce by opening other ports to trade. As soon as our men-of-war had defeated the pirates of Algiers, Morocco, Tripoli, and Tunis, the fleet proceeded to Turkish waters. As early as 1811, our exports to Turkey were valued at over \$1,000,000 a year. Smyrna was the only open Turkish port at this time, and our trade was very much hampered by the fact that all cargoes had to be landed at Smyrna. The navy commander of our squadron negotiated with the Turks for some years, but finally succeeded in opening the ports of Turkey to our trade, and an ex-naval officer was made our first diplomatic representative in Constantinople. The navy also opened the ports of China to American commerce in 1842. It was at the end of the opium war when the British made the "Treaty of Nanking" with China, whereby the five Chinese ports of Canton, Amoy, Fuchau, Ningpo, and Shanghai were thrown open to British merchants. The American naval commander, however, was on the alert, and at once obtained copies of this treaty, which he sent to Washington. Without waiting for action in Washington, he negotiated with the Chinese viceroy at Canton and secured the same privileges for American merchants that were accorded to the British.

Diplomatic work of the highest order was performed by our naval officers in opening to American commerce ports of Turkey, China, and Japan.

## NAVY PROTECTS TRADE

The navy department has divided the whole world into areas and has assigned an admiral with a squadron of ships to protect American lives, property, and commerce in each area. Should local revolutions in any part of the world threaten American lives or interests, our naval commanders are authorized to hasten ships to that locality. If our commander considers it necessary he lands men to protect our interests. Only recently the press contained notices of a probable battle between Chinese armies in the vicinity of Peking. In another column appeared the notice that the American cruiser *Albany* had anchored off Chinwantao, and had sent armed men to Peking to protect our interests. As our admiral commanding the Asiatic station considered the situation serious, he at once proceeded from the Philippines on the cruiser *Huron* to increase our forces near Peking. Two other cruisers have since been ordered. Foreign powers are bound by agreement to keep open the line of communications from Peking to the sea. Our navy is represented there now and ready to do its share.

During the Boxer troubles years ago, the allied naval forces were unable to communicate with the besieged legations in Peking. That we could not communicate with our legation during the Boxer trouble caused our government great uneasiness. Such, however, will not be the case this time, for the American navy had the foresight to install a powerful radio set in our legation at Peking. This radio set, the most powerful one in the Chinese capital, and the only one owned by Western or European powers, has an operating radius of 3,000 miles. Our admiral can keep in constant radio communication with our legation.

The navy maintains a patrol force of gunboats on the Yangtze River, and this Yangtze patrol guards our interest for some 1,700 miles up the river, right into the heart of China. It costs the navy some \$3,000,000 a year to guard our interests in the Asiatic. In this connection, it might be of interest to note that our exports to China in 1920 were valued at over \$145,000,000.

The navy maintains a force of destroyers in Europe for the purpose of guarding our interest in the eastern Mediterranean and in the Black Sea. We have no ambassador to Turkey. One

of our admirals is at present the American High Commissioner in Constantinople, and performs many difficult diplomatic tasks for the state department, in addition to the usual naval duties of guarding American interests with our naval forces. The Greeks and the Turks are at war and our interests are therefore in need of protection. We have large tobacco interests in the port of Samsun, on the Black Sea. In fact, 80 per cent of the Turkish tobacco exported from Samsun is shipped to the United States. The value of this tobacco amounts to \$15,000,000 annually.

As an example of conditions that often exist, during a recent war a certain foreign fleet bombarded frequently its opponent's ports; United States interests were great in one of these ports and there was a considerable American population. On the approach of the bombarding fleet the ranking American officer in command of our vessels would ask the commander to give the customary twenty-four-hours' notice before bombardment as required by international law in order that non-combatants might seek places of safety; in addition our naval officer would point out the fact that there were many American subjects and much valuable American property that would be destroyed in case of bombardment. Each time this matter came up the bombarding fleet refrained from firing on the city.

Americans have large oil interests in Roumania, and these are protected by our naval forces. Due to the unsettled condition in the Near East, it is almost impossible to do business by cable through, or to get transportation for our business men from port to port. Our destroyers have been sending these commercial messages by radio and have been giving passage to our business men from place to place. The result has been that American commercial interests have been increasing rapidly in this region. It costs the navy annually some \$4,000,000 to maintain our forces in European waters. This amount is mentioned merely to show how the navy money is spent in time of peace and how it benefits your commerce and therefore your prosperity.

Naval forces are maintained throughout the Caribbean Sea for the purpose of keeping down revolutions, protecting life, and protecting our commerce. Our trade could hardly exist throughout the West Indies, but for the protection given it by our Special Service Squadron. Our fruit trade throughout the West Indies

is enormous. In 1921 we imported fruit valued at nearly \$50,000,000 and a great deal of this came from the countries bordering the Caribbean. The arrangements for transporting perishable fruit have been so perfected by the great American fruit companies that should a dealer in Albany want a large quantity of bananas for the market on—say the first day of June—the fruit companies know they are safe in cabling to their big fruit ranches in Costa Rica that this amount can be cut on a certain date as transportation from the ranches to the market in Albany is assured due to the protection of our Special Service Squadron. If a revolution is brewing in the vicinity of the fruit plantation in question, our naval commander at Panama has only to dispatch a gunboat and the appearance of our flag is usually sufficient to relieve the situation. The result of this whole West Indian patrol so safeguards our trade in the Caribbean that bananas from certain Central American countries can be sold on the fruit stands in New York cheaper than apples which grow in our very back yards. The sailors doing duty in this squadron have dubbed these ships the “banana boats.” It costs the navy some \$3,000,000 to maintain this patrol throughout the West Indies.

Although our first fighting ship was built to protect the shipment of a small amount of wheat into the Mediterranean, our wheat exports have increased so that at present wheat valued at more than three-fourths of a billion dollars is exported annually. It is only the ships of the navy that keep the doors open to foreign markets.

The men on our plantations in the South are equally interested in foreign markets, as our exports of raw cotton amount to over \$600,000,000 annually. Our manufacturers are equally interested in maintaining the open door the world over, as our factories export machinery products valued at over a billion dollars a year. In fact, our total exports annually are valued at nearly eight billion dollars.

If we spend \$300,000,000 a year on the navy and thereby maintain an open market throughout the world for eight billion dollars' worth of exports, is this not a good investment? Money spent on the navy serves the dual purpose of insurance in time of peace and a fighting force in time of war.



Lloyd George has recently said at Genoa that Europe may again be embroiled in a terrible war, and that America would doubtless be drawn into it. We might well exclaim: "Why is America necessarily drawn into a European conflict?" The question is readily answered. Let any of the European powers start sinking American cargoes or passengers, and we would necessarily be drawn in. If, however, our fleet is strong and highly efficient, European powers would hesitate before making ruthless war on our commerce. It seems more than probable that Germany made ruthless war on our commerce, thinking that our notorious state of unpreparedness was such that she could this with safety. Is it wise for us to be in such a state of unpreparedness that we invite attack?

#### NAVY A GREAT HUMANITARIAN ORGANIZATION

In time of peace the navy is extremely active working in the interests of humanity. Our officers have been detailed as governors of the Virgin Islands, of Samoa, and of Guam, while temporarily we have military governors in Haiti and in Santo Domingo. The cost of the administration of these islands is a charge against the navy. The navy is constantly spending its money to give medical treatment to the inhabitants of the Virgin Islands, Samoa, and the Philippines, Guam and its lepers.

The navy assists shipbuilding and navigation. The president of one of our biggest shipyards stated recently in a speech that the insistent demands of the navy for high qualities of steel and machinery had assisted the American shipbuilders greatly in improving the quality of their work. But for the building of our men-of-war, our shipyards would have made little progress.

Money spent by the navy in experiments have resulted in the installation of electric machinery, of internal combustion engines, and of reduction gear for propelling ships. The U. S. S. *Neptune* was the first big ship to be driven by a reduction gear; the U. S. S. *Jupiter* was the first big ship to have an electric drive; and the U. S. S. *Maumee* was the first big ship to have internal combustion engines. These pioneer installations in three large naval auxiliaries, have given highly satisfactory results.

Our development of the radio has been of great assistance to all ships; merchant as well as men-of-war. The navy radio com-

pass stations established along our coast have already resulted in saving many ships from destruction. In fact, some fifteen vessels were saved from shipwreck during the past year, thanks to these navy radio compass stations. A few remarks on the operation of the radio compass may interest those who are not familiar with this subject. Suppose a ship is approaching New York, and due to foggy, stormy weather, the captain has been unable to work out his position at sea by the usual navigational methods. The captain has merely to tell his radio operator to call the radio compass stations and ask them to give him his position. When his radio operator makes certain prescribed signals, the navy radio station at the east end of Long Island determines the direction of the ship from his station, while at the same time the radio compass station on the Jersey coast makes similar observations. These two stations then inform the captain that his ship bears—say south from the Long Island station and southeast from the New Jersey station. Upon receipt of this information, the captain merely has to draw a line running south from the Long Island station and another line running southeast from the New Jersey station. The point of intersection on the chart shows the exact location of his ship. He can then safely set his course to enter New York harbor.

The captain of the army transport *Cantigny* recently congratulated the radio compass operators at Bar Harbor and at Cape Elizabeth, as these two stations gave him such perfect radio bearings that he was able to make port in safety although due to darkness and storm, he would have been unable to work out his navigation in the usual manner. Another report has recently come in from Alpena, Mich., to the effect that the naval radio station at that place was so helpful in advising the great merchant fleet on the Lakes that the station was practically indispensable.

There are naval hydrographic offices in all our great seaports. Ship masters can obtain charts and nautical advice from these officers. Pilot charts, which the navy issues monthly, are invaluable in showing all steamship captains the safest routes to be followed across either the Atlantic or the Pacific during the various months of the year. These charts also point out the worst storm areas and the best courses to follow. The U. S. S. *Hannibal* is constantly used to make surveys through the Carib-

bean Sea in order that better navigation charts may be issued to the ships of the world. The navy with her ships scattered all over the seven seas is constantly at work endeavoring to increase the safety of navigation, and to assist ships in distress.

### SEA POWER

There are many who think that our power as a great nation rests on the strength of our fighting ships. Such is not the case. "Sea power" is the basis of our real strength. By sea power, we mean a combination of all means by which we can gain and keep control of the sea. The first great element of sea power is the fighting ship, the second element is the merchant ship, and the third element is the base. A seaport well equipped with drydocks, repair facilities and food supplies, is a commercial base. Such a base, if protected in a military way, becomes also a naval base. Great Britain is truly a great sea power, for in addition to a good fighting fleet, she has a tremendous fleet of merchant ships, and has naval bases scattered throughout the world. Those bases are both commercial and naval. If, for instance, the British wish to send their fleet to operate in the western Atlantic, they have a splendid naval base at Halifax, and smaller ones at Bermuda, in the Bahamas, at Jamaica, and at Trinidad. If the British wish to have their fleet operate in the China Sea, the fleet could sail from British waters and replenish their fuel and other supplies at Gibraltar, at Malta, at Suez, at Aden, at Colombo, at Singapore, and finally operate from a well defended base in Hongkong. This great line of communication between the home land and Hongkong is well supplied with splendid naval bases. Fleets cannot operate unless they are attended by a large number of auxiliaries. It is vital for us to develop our merchant marine and to develop our bases if we wish to be a real sea power, and be one of the first powers of the world.

History shows that nations have risen to great power and have fallen with the rise and fall of their sea power. After the discovery of the western world the Dutch, Spanish, and the French all planted their flags on the Atlantic coast of North America. When, however, in 1588, the British fleet defeated the great Spanish Armada, Spain could no longer hold her possessions in North America. A century later the British defeated another

great rival, Holland, and the Dutch colonies in North America fell. As a result of the seven years' war, the British defeated France, and the control of North America passed to the Anglo-Saxon race.

The rise of England as a great sea power was really the result of Cromwell's navigation act. By this act, which was issued in 1651, all British exports and imports between England, Asia, Africa and America, and to a limited degree, from the continent of Europe, had to be carried in British merchant ships. Thus the British merchant marine was firmly founded. The merchant fleet and the fighting fleet expanded hand in hand, and the British nation became a great sea power.

Many think that if we grant a subsidy to our merchant marine, we are giving money needlessly to our shipowners. If we export products valued at some eight billion dollars annually, and ship this great quantity of material in foreign bottoms, we are obviously paying thousands of dollars in freight charges to foreign shipowners. This money then goes to foreign shipbuilders, foreign shipyard workers, and to foreigners in all walks of life. Other great powers have found it necessary to subsidize their merchant marine in order to build up a merchant fleet. Why do we not profit by their example and subsidize our merchantmen in order that we may spend millions of dollars annually in our own shipyards and in our own factories?

#### WHAT THE FLEET CONSISTS OF

The fleet, to be a well-balanced fighting organization, consists of several types of weapons.

The most important is the battleship. This ship is the backbone of the fleet. The battleship must be supported by many other types of subsidiary weapons, from airships to submarines.

The destroyer is next in importance. This type is used to protect the battleship against submarines, to attack enemy battleships and plane carriers, to attack enemy submarines and destroyers and to convoy merchant ships through waters menaced by submarines.

The submarine is another important type. It is used to attack capital ships, plane carriers, armed merchantmen and transports. As a scout it is also invaluable, since it can remain close to the

enemy's ports where practically unseen, it reports by radio movements of the enemy's force. It can also lay mines off the enemy's ports.

The cruiser is also of great importance in the fleet. The battle cruiser is of first importance, for with its high speed and large guns it can drive off the enemy's scouts, defeat any type of vessel except the battleship and thus prevent the enemy's scouts from approaching the battleship fleet close enough to determine its character. Smaller cruisers are invaluable as scouts and are needed in considerable numbers. If we were conducting a campaign across the ocean, we would have to depend upon them to locate the enemy's fleet and to report its movements. Light cruisers are also used to raid enemy shipping, to protect our own, and in actual battle, to drive off enemy destroyers while protecting ours.

The plane carrier is a new weapon in naval warfare. The navy fully recognizes the great importance of aerial warfare and is particularly desirous of completing the five big plane carriers allowed us by the terms of the recent Naval Treaty. Fast plane carriers will be invaluable for use as scouts, but in addition they can send their scouting planes out in all directions to look for the enemy and to inspect enemy ports. In addition, bombing planes may be held in readiness to bomb enemy ships and ports.

Mining ships constitute new weapons in modern warfare. This type comprises mine layers and mine sweepers. Their names indicate their activities.

We must have a suitable number of all types of ships in order to have a well balanced fleet. At present we are woefully short of cruisers, although we have a considerable number of destroyers. There is a popular impression that our excess destroyers can take the place of cruisers. This is erroneous.

Before the advent of the submarine, and before the details of trans-oceanic scouting were fully appreciated, we had determined that four destroyers were necessary for each battleship. Due to the advent of the submarine, four destroyers for each capital ship are barely sufficient to provide a close submarine screen around the battleship fleet. With the absence of cruisers, it would be necessary to send out another large force of destroyers to scout for the enemy. A third force of destroyers would be needed to

convoy our transports and supply ships through submarine-infested waters. During the recent war, we finally employed some sixty destroyers to escort our transports and auxiliaries through the submarine zone. Even under the recent treaty, our armed transports and auxiliaries would be subject to submarine attack so we would still need destroyers for convoy purposes. If we had some fifty or sixty light cruisers, we could utilize them as scouts and would then not need the large number of destroyers now on the navy list. We have no first line light cruisers at present and but ten building. Another great power has forty-six first line and fifteen second line light cruisers, which gives this power a better balanced fleet. Some may ask why we have built a large number of destroyers without building light cruisers. The answer is that during the recent great war we felt the great need of destroyers for convoying troops and supply ships. The construction of a large number of destroyers resulted. Every effort is now being made to preserve the material of these destroyers, even though they are out of commission. Our long coast line along the Atlantic, Gulf, and Pacific coasts, necessitates a large fleet. To maintain in repair these ships, it is obviously necessary to have a number of navy yards on both the Atlantic and Pacific coasts. If we would be prepared to operate our ships efficiently in time of war, it seems clear that we should keep the various types of ships concentrated into fleets that they may be maneuvered as fleets in time of peace. That is why all the first-line battleships are kept in one battle fleet.

It is quite appropriate in discussing the fleet and the type of ships to discuss the number of men needed to man this fleet. As ships in themselves are only masses of steel, men are of vital importance. Men fight—not ships.

The navy does not contemplate keeping all our ships in commission in time of peace, as this would require over 120,000 men. After an exhaustive study of the question the navy department decided that in view of the economic situation in the country, it would ask for 96,000 enlisted men and apprentices. Congress will probably vote the funds to provide for a navy of 86,000 men. The navy department will, of course, use every endeavor to make this number of men effective. There will be under this apportionment

no destroyers and no submarines in reserve; they will be put out of commission.

There seems to be a general impression that the treaty navy consists of eighteen battleships with little else. As a matter of fact, the treaty navy consists of eighteen battleships, and five plane carriers, and all the cruisers, destroyers, submarines, mining ships, and auxiliaries we choose to build. While it is true that with 67,000 men we could man eighteen battleships, with this number of men we could not efficiently man the other types of ships necessary to make up a balanced fleet. It would be out of the question to attempt to return to our pre-war basis since prior to the great war we had no aviation service, no mining service, or no submarine service worthy of mention. We should now make every effort to develop naval aviation, submarines, and our mining forces. On account of the necessity of maintaining all of these types of ships, we require the men the navy department has asked for. There have been heard many arguments pro and con as to how many men the navy needs. It has been said that because one naval officer wants 1,200 men for a battleship and another 1,300, that the navy does not know what it wants. These differences are very small. In fact, they are smaller than the differences you would get from any two men in any walk of life on a given subject. The navy is, however, unanimous in its agreement that we must have all types of ships in commission in time of peace, and the navy is in accord that we should not go below the number of men for safety and emergency.

It takes years to train a naval officer so that he can with certainty go out and handle a big ship or maneuver a fleet. The navy believes that we should not throttle the output of the Naval Academy and reduce its natural value as a great educational institution.

There is an erroneous idea that it is most unusual to give a boy in this country a free education by sending him to the Naval Academy. How curious! Have we not some 22,000,000 pupils in our public schools and do not the people of the United States spend over a billion dollars a year to give them a free education? The national government spends little on education, leaving to our cities, states and counties the duty of educating our children.

The Naval Academy is the only great nautical college in this country. If we are to have a great merchant marine and great shipyards, we shall have great need for men of nautical training. Many graduates from the Naval Academy have risen to high positions in civil life: such as Homer Ferguson, president of the Newport News Shipbuilding Company and president of the Chamber of Commerce of the United States; J. W. Powell, one-time president of the Fore River Shipyard, then manager of five shipyards for the Bethlehem interests during the recent war, and recently president of the Emergency Shipbuilding Corporation; and Wm. Emmett, the designer of the electric drive for ships. These are but three of the Naval Academy graduates who have resigned and gone into civil life to help our shipbuilding industries. There are many others.

Under existing law, we can have over 3,000 midshipmen at the Naval Academy. About sixty per cent of those entering are graduated. Thousands of boys are unable to get seats in the overcrowded schools of the country.

#### FALSE PROPAGANDA AGAINST THE NAVY

A few remarks concerning false propaganda circulated to impair the strength and efficiency of the navy will not be amiss.

(a) *Excessive Cost.* It is quite a popular fallacy to think that a holiday in battleship building will bring a great reduction of taxes. The people do not appreciate that the cost of government involves four great budgets and not merely the budget passed by Congress. They are: The national budget, the state budgets, the county budgets, and the city budgets. The cost of government may be high in the United States, but the federal budget comprises hardly one-third of the total cost of government. Here in New York City, the people must raise some \$400,000,000 to meet the state, county and city budgets. This means that the per capita cost of state, county and city government in New York City is about \$72.00. The cost for the whole navy, if Congress appropriates \$300,000,000 for it, will be less than \$3.00 per capita. If, therefore, the whole naval appropriation were eliminated, the per capita cost of government in New York City would be little reduced. We can hardly say that it is a terrible extravagance to spend \$300,000,000 a year on the navy, when we spend over \$1,141,000,-



ooo annually on tobacco alone. During the past year we spent three times the cost of the entire navy on admissions to theatrical and other amusements. We spent twice the cost of the navy on candy and chewing gum. This is an extravagant country, but it is not an extravagance to spend \$300,000,000 on the navy when we realize what the navy means to us and to our prosperity. If you want a substantial relief from the burden of taxation, would it not be wise for you to appeal to your state, county and city governments for a holiday?

(b) *Disarmament to Prevent War.* A slight study of history is sufficient to show that disarmament will not prevent war. At the end of our Revolution, we put total naval disarmament into effect, and almost immediately had to start building men-of-war in order to get our products to a foreign market. What would happen, as a matter of fact, if all powers in the world sunk every fighting ship in existence? Upon the declaration of war, our merchant ships would become our men-of-war. It would merely be necessary to put guns on our merchant ships and the big ocean liners would be converted into battleships and the fast yachts into cruisers and destroyers. In 1812, when we had practically no fleet at all, we mounted guns on 500 of our merchant ships and they became fighting ships and destroyed some 1,350 British merchant ships. The recent Naval Treaty permits all countries to put gun foundations, capable of taking six-inch guns, on merchant ships in time of peace. With all fighting ships abolished and guns put on merchant ships, England, with her 10,000 merchantmen, would at once control the seven seas, for she has more merchant ships than all the other great powers put together and more naval bases from which to operate them than all other powers combined. It seems futile, to even suppose that fighting would stop if we sunk our fighting ships. We do not have to turn back the pages of history very far to find that great battles were fought before the advent of modern fighting ships. In fact, if you turn to *Creasy's Fifteen Decisive Battles of the World*, you will find that over 2,000 years ago, one of the decisive battles of the world was fought between fleets of galleys and before gunpowder was known. It was in 415 B. C. that the Athenian fleet was defeated off Sicily and Athens lost control of the eastern Mediterranean and her sea power was ended forever. Crews of these galleys were armed with

slingshots and catapults. If we diminish our naval power, we lessen our influence in the world to preserve peace. Many writers have pointed out that had we not been a great world power, we could not have called the recent world conference, in Washington. If China had called a world conference to consider a reduction of armament, the world would have looked upon it as a huge joke. If now we reduce our navy to a state of impotency, we will reduce our power to do good and our power to keep the peace of the world.

(c) *Navy not a Destructive Force.* Many of the pacifists actually seem to think that military forces are only bent on destruction. As a matter of fact they are really constructive. Wherever they go, they better local conditions, establish schools, and improve public health. What was Panama at one time before we went there? It was a fever-infested place where human beings died like flies. America sent a military force there, which soon converted Panama into a regular health resort, and a great canal, one of the engineering wonders of the world, was soon completed and put into operation. It can be truly said that our armed forces have saved more lives than they have taken. After the Spanish war, by the introduction of good sanitation, we saved more lives in Cuba and Porto Rico than we took during the war. Some months ago, during the great coal strike in West Virginia, when lives were being sacrificed at an alarming rate, the regular army appeared and good order was quickly restored without the firing of a single shot. The horrors of war are very much exaggerated. Over 12,000 people are killed annually in the United States by automobiles. Yet we still think of the horrors of a bloody battle, but give little heed to the lives lost by careless operation of automobiles.

(d) *Responsibility of Leaders.* Propagandists anxious to "wreck the navy" invariably tell you that they are responsible for the statements they make. How can men who do not occupy responsible positions be responsible for what they say? The soap-box orator on the street corner may say he is responsible for what he says when he advises the public to destroy our military forces. However, the soap-box orator, as well as most peace society leaders, is not responsible and his statements should carry little weight. Our President, the man the voters have put in the White House

to administer our affairs, is a responsible spokesman. From Washington to Harding, these spokesmen have advocated a strong navy. Let me quote from a few of their messages:

Washington said in 1790 that "To be prepared for war is one of the most effectual means of preserving peace." Again he said, "To secure respect to a neutral flag requires a naval force organized and ready to vindicate it from insult or aggression."

Adams said, "We ought, without loss of time, to lay the foundation for an increase of our navy to a size sufficient to guard our coast and protect our trade. Such a naval force will afford the best means of general defense."

Jackson said, "Constituting as the navy does, the best standing security of this country against foreign aggression, it claims the especial attention of government, and should continue to be cherished as the offspring of our national experience."

Lincoln said regarding the civil war, "The events of the war give an increased interest and importance to the navy which will probably extend beyond the war itself. I commend to your consideration the policy of fostering and training seamen for the naval service."

Grant said, "With an energetic, progressive, business-like people like ours, penetrating and forming business relations with every part of the known world, a navy strong enough to command the respect of our flag abroad is necessary for the full protection of our rights."

And Roosevelt said, "But there is something we need even more than additional ships, and this is additional officers and men. To provide battleships and cruisers and then lay them up with the expectation of leaving them unmanned until they are needed in actual war, would be worse than folly. It would be a crime against the nation."

Our position as a world power varies with the strength of our fleet. Our power to protect our citizens and our commercial interests abroad varies with the strength of our fleet. Our power to call a world conference to preserve the peace of the world varies with the strength of our fleet. Our presidents, who are our real responsible leaders, have always advocated an efficient fleet.

The naval officer is not interested in any one section of our country or in any one industry, but he is interested in the develop-

ment of our country as a whole, in fostering and protecting our citizens and our commercial interests abroad. He does not want war, but does ask for a 100 per cent fleet that he may uphold our national dignity, protect our commerce, and our citizens abroad, and be ready for battle when the crisis comes.

### NAVY DOES NOT CAUSE WAR

"Small navy" advocates like to say that a big navy fosters war. Face the facts and ask yourselves, how did we come to enter the recent war, the Spanish war, the civil war, the Mexican war, the war of 1812, the naval war against the French, the war against the pirates of the Barbary Coast, and the war of the American Revolution? We find without much research that the navy was in no way responsible for any of them. It was the people, bringing pressure upon Congress, who brought about the declaration of hostilities.

In time of peace, our statesmen, chosen from civil life, run our government and determine its foreign policies. To the navy falls the task of preserving peace, sometimes at home, sometimes abroad. When the government is no longer able to maintain peace, Congress declares war. The navy steps in and restores peace, returning the reins of the government to the civil officials.

The statesmen who recently gathered in Washington developed plans which they hoped would preserve the peace of the world. If these steps prove successful, we shall have peace. Let us keep up our navy so that we may again sit at the first table at the next conference.

## DISCUSSION

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### Co-ordination in Army and Navy Training

(SEE PAGE 593, WHOLE No. 230.)

CAPTAIN RIDLEY McLEAN, U. S. NAVY.—We are all prone to deal in generalities, and any officer who reads either the title or the contents of the very timely essay by Colonel Williams, entitled "Co-ordination in Army and Navy Training" will at once agree with the general idea therein expressed; but with this concurrence the subject will probably be dismissed from his mind. It is not my object either to criticize or to amplify Colonel Williams' excellent paper, but rather to bespeak for it more than a mere passing approval. It is not mere approval that is necessary, it is action. Before I began my course at the Army War College I was quite prepared to concur in general with Colonel Williams' arguments as to the necessity of co-ordinating the training of the two services, but I shall never forget, as my very first outstanding impression after entering upon my work at that institution, my keen appreciation of the fact that the *army* and the *navy* are merely arbitrary divisions in a larger organization—the fighting forces of the United States—upon which falls the task of defending this country in war.

In a study of this nature we obscure the issue if we devote attention to the numerous minor disturbances short of real war which may be handled by either service separately; therefore in the following remarks I consider only a war requiring a major effort. In such a war the activities of the two services merge into one as surely as do the activities of the destroyer force and the battleship force in a naval engagement, or as do the artillery, the infantry and cavalry in a land battle. In such a war the army and the navy are merely two grand divisions of a single fighting force under a common commander, the President.

It is trite to say that in waging such a war it is necessary that these forces co-operate. Every officer knows this, just as every officer, including the participants, knew that it was necessary for the Allied armies to co-operate with each other during those fateful years before the appointment of Marshal Foch actually effected this co-operation. In other words the necessity for co-operation is fully appreciated by all; but this is not enough—just as it was necessary in the Allied armies to take active steps to insure effective co-operation, so are active steps necessary if we are to have the most effective co-operation between our two services. It must not be assumed that this co-operation will come naturally without such effort.

If two officers in responsible positions, each of dissimilar training and habits of thought and not intimately familiar with the problems of the other, are brought together in conference, their co-operation, however much they may realize its importance, is more than likely to be academic and superficial. Real co-operation, that which is essential to the highest efficiency in preparation for and in conduct of war, is something deeper than this; such co-operation must not be merely mental, it must rest upon a basis of mutual appreciation and sympathetic understanding of the problems presented. It is dependent largely upon a similarity in the mental processes of the two officers, which in turn is largely the result of similarity in their prior training. Unless deliberate steps be taken to effect this end, real co-operation will not characterize our operations of war. Colonel Williams recommends co-ordination of training as the one practicable means of attaining the desired end.

By reason of its geographical configuration, a war-plan for our own country, more perhaps than is the case in any other country, must be based upon the capabilities of both the army and the navy. It must be a combined affair. The plans of either service made separately, or even in incomplete harmony with the other, are futile, and when the emergency arises if such plans are not impossible of execution they will at least fail to produce maximum results. The existence of the joint board is a recognition of this fact, but the co-operation between the members thereof will only be complete when harmony of thought shall have been created by a similarity of professional education.

A hurried reading either of the above remarks or of Colonel Williams' paper may leave the impression that it is only in planning and conducting operations of war that co-operation is necessary. It is for that reason that I desire to emphasize a feature which has been most strongly brought home to me during my eighteen months' service at the Army War College, namely, that however important co-operation may be in active operations, co-operation between the two services in the broad question of procurement of personnel and supplies and in fact in all features involved in preparation for war, is even more important, if possible, than in war itself.

Space forbids an extended discussion of this feature; it is sufficient to point out that for personnel, raw material, fabricated products, transportation, and manufacturing facilities the army and the navy both draw from the same reservoir; and too this reservoir must at the same time supply the civil population with commodities necessary to the life and morale of the nation. Consequent upon this, super-agencies forming in effect a staff of the President as commander-in-chief, controlled supply in all of its phases during the latter part of the Great War and unquestionably must do so again in another major effort. In their dealings with these super-agencies, the army and the navy come, as bidders for the same commodities, the same personnel and the same facilities, more closely in contact even than in the operations themselves. It is here that that mutual understanding of the mission and problems of the other, and a sympathetic realization that

each service is working as a unit of the same organization for a common end is especially necessary.

It may be stated: "Yes, this is true; but how can this co-operation be obtained practically?" The answer, as suggested by Colonel Williams, is: "By education and combined operations in peace." By such means not only will each service be familiarized with the problems of the other, but by the contacts thus rendered possible between officers, personal friendships, and feelings of mutual professional esteem are formed, the importance of which can scarcely be overestimated in the promotion of co-operation in subsequent campaigns in which these same officers will participate in important rôles.

To those who would suggest that it is impracticable to thus educate all officers of each service in the advanced schools of the other, it should be pointed out that this is by no means necessary. The essential official contact between the army and the navy necessarily occurs chiefly between the higher commands,—in the plan-making divisions, the joint board, the bureaus in the departments and in the corresponding agencies respectively afloat and in the field. A liberal policy as to the utilization of the educational facilities of the sister service on the part of each, would in a few years produce a sufficient sprinkling of officers in each service who were graduates of the War College of the other, largely to effect the ends desired: a few actual maneuvers involving embarkation, convoy and landing operations on a major scale would go far towards avoiding a future Gallipoli in the history of our country.





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ANNAPOLIS, MD., May, 1922

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# PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT R. A. HALL, U. S. Navy

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## FRANCE

NAVAL CONSTRUCTION.—After undergoing several modifications since its introduction two years ago, the programme of naval construction, providing for an expenditure of 755 million francs to be spread over a period of four years, has been adopted by the Senate. The five battle-ships of the *Normandie* class, which were started upon before the war and are now hopelessly out-of-date, are, of course, to be scrapped. The *Béarn*, which was near completion at the armistice, is alone to be utilized as a seaplane carrier. The new constructions comprise three light cruisers of 8,000 tons, which are to carry eight guns of 150 mm., four of 75 mm., and eighteen torpedo tubes, and to be capable of steaming at 34 knots; six destroyers of 2,500 tons with a speed of 35 knots; twelve torpedo boats of 1,400 tons with a speed of 32½ knots; and twelve submarines with an immersed displacement of 1,100 tons and having a radius of action of 7,000 miles. The programme came in for some stringent criticism on the ground that it was a continuance of the policy adopted for so many years past of equipping the navy with a variety of "samples" that prevented the constitution of a homogeneous fleet. It was admittedly a provisional programme, adapted to the present financial conditions, and was intended to "carry over" until such time as a more ambitious scheme of construction could be introduced, for the general tendency of the debate was in favor of France possessing an adequate defensive navy which could not be sacrificed even if the security of the country were guaranteed by other naval powers. The idea of constructing capital ships up to the tonnage allowed by the Washington Conference seems, for the moment, to have been abandoned. No one suggested their necessity or even their utility, and it is noticeable that French naval strategy is centered entirely in the light and fast cruisers, destroyers, submarines, and air craft.

The minister of marine affirmed that the future programme would provide for a complete organization of aeroplanes in association with a large number of submarines, and it was evident from the debate that no concession is likely to be made to other Powers in the number of submarines that may be constructed, for vessels of that type are regarded as indispensable for the security of the country and for maintaining a seaway between France and North Africa.—*The Engineer*, 24 March, 1922.

**FRENCH TAKE OVER RUSSIAN STEAMER.**—The steamship *Chicago* of the French line arrived from Havre on Saturday last bringing Captain August Vioulles and twenty-one officers and men to take over the Russian steamer *Penza*, formerly of the Russian volunteer fleet, which has been lying for months in the Erie Basin, Brooklyn. Her name will be changed to *La Maras*. She is a vessel of 2,679 gross tons and was built at the Schichau Yard, Danzig, in 1909.

It is stated that the Soviet government is very much exercised at the way in which vessels of the Czar's government have been acquired by foreign powers and that it intends to demand the return of these ships at the coming Genoa conference.—*Nautical Gazette*, 8 April, 1922.

## GERMANY

**GERMAN NAVAL NOTES.**—Further particulars are to hand of the post-war German naval organization. The establishment of armoured ships and light cruisers, as specified by the peace treaty, is equally divided between the Baltic and North Sea stations, but for some reason—probably not unconnected with the financial situation—only a few ships are in full commission so far. The active squadron in the Baltic comprises the battleship *Hannover*, the light cruiser *Medusa*, the tender *Nordsee* and a torpedo flotilla of 12 boats with the *T-44* as leader. There are also in commission a half-flotilla of minesweepers, the gunnery tenders *Drache*, *Delphin*, and *Hay*, the surveying ship *Panther* (ex-gunboat), and a few miscellaneous auxiliaries. In reserve on the Baltic station are the battleships *Hessen* and *Schleswig-Holstein*, and the light cruisers *Berlin* and *Thetis*. The active North Sea squadron, based upon Wilhelmshaven, consists of the battleship *Braunschweig*, light cruisers *Hamburg* and *Arcona*, and a mine-sweeping flotilla which includes the large fleet sweepers *M-134*, *M-138*, and *M-81* (511 tons, 16 knots), besides a few auxiliary craft. In reserve are the battleships *Elsass* and *Schlesien* and the light cruiser *Amazon*.

Most of the vessels mentioned above have undergone a certain amount of reconstruction since the war. \**Schlesien* and *Schleswig-Holstein* have each been given a secondary armament of fourteen 5.9 in. in place of the original fourteen 6.7-in. guns; the five submerged torpedo-tubes on the broadside and at the stern have been removed and four 19.7-in. deck tubes fitted instead, this latter change having been made also in all the remaining pre-dreadnought battleships. The light cruisers *Berlin*, *Hamburg*, *Arcona*, *Medusa*, *Amazon*, *Thetis*, *Nympe*, and *Niobe* have been rearmed with ten 4.1-in., 45-cal. guns and two 19.7-in. deck tubes, in place of the 40-cal. guns and 17.7-in. tubes originally mounted; and the 16 largest destroyers, *T-175* to *S-23*, now carry two 4.1-in., 45-cal. Q.F. apiece.

The first authentic details of new ships that were in hand at the armistice have lately been published in Germany. They included the battleships *Sachsen* and *Württemberg*, launched in 1916 and 1917 respectively, which were identical in every way with the *Raden* and *Bavarn*, and the battle cruisers *Graf Spee* (*Ersatz-Blücher*) and *Mackensen* (*Ers. Viktoria Liuse*). These two last-named ships are of unusual interest, for they were designed in 1913-14 and thus represented the German reply to our *Lion* class and the *Tiger*. Their displacement was 31,000 tons, the designed speed 28 knots,

and the armament was to have been eight 14-in. guns, twelve 5.9-in., and eight 3.4-in. Q.F., and five torpedo-tubes. The complement was 1,429. They were thus considerably larger and more powerfully armed than their British contemporaries, and showed a distinct advance over the *Derfflinger-Lützow* class, of 26,000 tons, 26½ knots, and eight 12-in. guns. The 14-in. (35.56-c.m.) gun was 50 cal. in length, firing a 1,364 lb. projectile with an initial velocity of 2,870 ft.-secs., and penetrating 44.8 in. of steel near the muzzle. In spite of its larger calibre, this gun weighed rather less than the British 13.5-in., 45-cal., so that in the two German ships, with their increased tonnage and less powerful machinery, a large margin must have been available for protection. It is clear that Germany still preferred to differentiate between battleship and battle cruiser in armament as well as in speed, for the battleships coeval with *Graf Spee* and *Mackensen* were armed with 15-in. guns.

Besides those scuttled at Scapa Flow, there were five light cruisers, completing at the date of the armistice, viz., *Wiesbaden*, *Rostock*, *Magdeburg*, *Fraunelob*, and *Leipzig*, all of which had been launched in 1917 or 1918. Together with the *Dresden* and *Köln*, both lost at Scapa, these five vessels belonged to a type which had evidently been standardized as the most appropriate for German requirements. It differed from the majority of our cruisers built under the war programme in having greater displacement, higher freeboard, and heavier armament, but less speed, and was probably superior for general purposes, though perhaps unnecessarily large and expensive for service in the North Sea and the Baltic.—*Naval and Military Record*, 5 April, 1922.

GERMAN AVIATION.—The following is a translation of an article by Lieut. Colonel Reboul of the French army, which appeared in a recent issue of the French publication *Le Temps*:

The ministry of war of Germany has just published regulations which enlighten us on the state of mind of the German high command and its designs. The "Instruction on the employment of aviation to be used for maneuvers, regimental exercises and drills in tactics" is a statement in concise form of the opinions of the German high command on the employment of aviation during the war.

Article 198 of the Treaty of Versailles prohibits Germany from keeping any aeronautical force whatever. This, however, does not prevent the minister of war from declaring in this instruction: "In the distribution and employment of the aviation formations we have taken as a basis a modernly equipped army for use in giving decisive combats." It does not prevent the cadres of the *Reichswehr* from already undergoing training in the use of the aeroplane. In their *Kriegsspiele* they assign missions to it and receive information from it. They are accustoming themselves to handle it, to consider it as an arm, the collaboration of which is indispensable. They are making preparations to use aeronautics in connection with the other arms.

Doubtless the *Reichswehr* will be unable to begin the actual exercises so long as our control commissions remain in Germany. But the day they leave, the "Instruction on aviation" will immediately be put into effect. The plan being already known to all, it would require but a short time to put it into operation and have an aviation force working in close union with its command, its infantry, its artillery and its cavalry.

Chapter II of the regulations treats of the aerial formations. It provides for an exceedingly high aviation equipment for each large unit.

The infantry division includes organically a strong squadron of two escadrilles. One of these, the reconnaissance escadrille, will be used for close missions and for observation of the battlefield. The other will work

with the divisional artillery. Each of these escadrilles comprises twelve aeroplanes. The German army thus realizes the desiderata which we expressed at the end of the campaign of 1918. The division is henceforth permanently equipped with its eyes and observers. Its aviation will work constantly with the same units. They know one another wonderfully well; they have confidence in one another; they conform to one another's customs and idiosyncrasies. The results will be incomparably greater than those obtained with escadrilles that are assigned only temporarily to the divisions. At the moment that everyone begins to speak the same language the escadrille is replaced by a new one. Everything must be begun all over again.

The army corps has its own squadron which has the same composition as the divisional squadron. Its reconnaissance escadrille will specialize in photography and in night reconnaissance; its artillery escadrille will regulate the heavy artillery firing of the army corps.

The army is very strongly equipped with aviation units. The regulations provide for the assignment to it of one observation squadron, combat squadrons, pursuit squadrons and bombarding squadrons.

The observation squadron is of the same type as the divisional squadron; but its aeroplanes will as a rule be superior. They will, in fact, penetrate more deeply into the enemy lines. The reconnaissance escadrille will make distant reconnaissances and photographs of the enemy's rear areas. The artillery escadrille will regulate the fire of the high powered heavy artillery which will be directed against the enemy quarters, its parks, railways, installations and points through which it is compelled to pass.

Each army in active operations has assigned to it a combat unit with a strength of three or four squadrons. Each squadron comprises four escadrilles of twelve aeroplanes each. This represents a body of 150 to 200 aeroplanes which will have as its mission to take part in all the phases of the battle, both in aerial combats and in combat against the other arms. In an attack it will act with the assaulting troops, will precede the first waves, mowing down the enemy reserves and bombarding the centers of resistance.

The pursuit unit will be especially charged with the aerial fighting. It comprises from four to six pursuit squadrons, each squadron comprising three escadrilles of twenty-one planes. Its mission is to hinder the enemy reconnaissance and prevent the enemy combat aviation from taking part in the battle. It must enable its own reconnaissance aeroplanes to accomplish their mission. Its object is aerial combat. Pursuit planes should act in mass so as to be master of the air, at least during certain hours. They may be reinforced for certain missions by combat and bombarding squadrons.

The bombing aviation is less strong numerically than the combat and pursuit aviations. It consists of from one to three squadrons, each formed of three escadrilles of twelve planes. It is to be used in bombarding by day as well as by night.

The group of armies has only a very limited aviation force, which consists of one escadrille of twelve planes for making reconnaissance which are of special importance to it and which it wishes to entrust to observers whom it knows and can rely upon, and one artillery escadrille of twelve planes for the long-range and very mobile guns, especially those on railways, which it fires now in one direction, now in another.

The general headquarters reserves a few combat and pursuit squadrons both for its own safety as well as for an aerial reserve. It will itself conduct the fighting against vital points in the enemy's back areas by means of bombing squadrons and giant aeroplanes which it will bring into action.—*Aerial Age Weekly*, 3 April, 1922.



GERMANY NEED ONLY BUILD 126,000 TONS FOR ALLIES.—One by one the reparation clauses of the Versailles Treaty are being either disregarded or whittled down. The latest one to be almost entirely waived is the one in regard to the construction by Germany of 1,000,000 tons of shipping for the Allies.

In accordance with the terms of the treaty, Germany was obligated to lay down 200,000 tons gross of new merchant shipping each year for a period of five years beginning with April 10, 1920. As explained in the British House of Commons, by Sir Robert Horne, chancellor of the exchequer, however, no such tonnage has as yet been laid down, and in view of the fact that Great Britain and Japan have waived their claims, the maximum that can be required from Germany after April 10, 1922, is only 42,000 gross tons a year for three years. France and Italy intend to have a few vessels laid down in Germany on their own account.—*Nautical Gazette*, 22 April, 1922.

### GREAT BRITAIN

NAVAL VESSELS UNDER CONSTRUCTION.—According to information given in the course of Parliamentary business, there are thirty-two vessels at present under construction for the navy, representing a total cost, including guns, of about £20,500,000. The vessels are all cruisers or smaller craft, the exact details being seven light cruisers, six destroyers, eight submarines, six coastal motor boats, one mine layer, two flotilla leaders, and two aircraft carriers. Many of the vessels have been under construction since 1917. It was added on the same occasion that since the armistice no subsidies had been paid to any armament firm.—*The Engineer*, 7 April, 1922.

INFLEXIBLE TO BE BROKEN UP IN GERMANY.—The battle cruiser *Inflexible*, which helped to sink von Spee's German squadron off the Falkland Islands, and thus avenged the loss of the *Good Hope* and *Monmouth*, left Devonport on Saturday in tow of the Dutch tugs *Zwart-see* and *Witte-see* for Germany, where she is to be broken up.

Launched in 1907, the *Inflexible* is one of the three first battle cruisers built for the royal navy, the others being the *Invincible*, which was sunk at Jutland, and the *Indomitable*. The *Inflexible* was the vessel which had the distinction of flying an admiral of the fleet's Union Jack across the Atlantic when she visited New York as flagship of Admiral of the Fleet Sir Edward Seymour for the Hudson-Fulton celebrations in 1909.

Early in the late war the *Inflexible* took part in the Heligoland Bight action, and the next time she came into contact with the Germans was off the Falkland Islands against von Spee's squadron. She also took part in the battle of Jutland.

Last year the *Inflexible* was taken to Devonport to be converted into a training ship for boys, but the proposal was abandoned on the ground of cost.—*Naval and Military Record*, 12 April, 1922.

OIL CARRIER "NASSA."—The single-screw oil carrier *Nassa*, which has been built by the admiralty at Devonport on a fixed price contract for the Anglo-Saxon Petroleum Co., Ltd., London, is the second oiler to be built in the Devonport yard, under the repayment system inaugurated by the Colwyn committee, to provide work for the employees in the admiralty dockyards, but the launching this week is especially interesting, as she is the first vessel laid down in the yard for an outside firm. Laid down on March 8, 1921, the vessel is being built on No. 4 slip at the South Yard. She is being built on the Isherwood system of framing, so that the main frames are longitudinal instead of transverse, and she will have a dead-

weight capacity of about 8,400 tons. Her principal dimensions are: length (between perpendiculars), 417 ft.; breadth (extreme), 53 ft. 4 in.; depth (moulded), 31 ft.; gross tonnage, about 5,680; underdeck tonnage, 5,263; net tonnage, 3,435 tons; and she will have a speed of 11 knots. Her engines are of the triple expansion type with cylinders of 27-in., 45-in., and 74-in. diameter, and with a stroke of 48 in. these are estimated to produce 2,800 horsepower at from 78 to 80 revolutions per minute. Her three single-ended boilers, 15 ft. 6 in. in diameter, by 11 ft. 7½ in., are designed to burn either coal or oil fuel. She will carry about 1,140 tons of fuel.

The vessel has been designed to carry oil in bulk in nine main tanks and five other tanks, and a 10-in. double pipe line is intended to obviate mixing when different kinds of oil are being carried.—*Naval and Military Record*, 29 March, 1922.

**A VANISHED FLEET.**—Before the end of the present year the reserve fleet, as we have known it for many years will have ceased to exist. and for the first time in the modern history of the navy there will be no second line of ships to reinforce the battle fleet. This is one of the consequences of the Washington naval agreement, which provides for the scrapping of practically all the capital ships now in reserve. It is possible that further units will be withdrawn from the Atlantic and Mediterranean fleets in the near future, in which case the ships thus released would go to build up a new reserve, though the admiralty are known to be strongly opposed to any further cut in the strength of those formations. This virtual abolition of the reserve fleet is a step that could not have been taken unless accompanied by similar action on the part of other naval powers, but, as the United States and Japan have both agreed to scrap all their second-line capital ships, the disappearance of the reserve fleet will involve no weakening of our relative position at sea.

One of the indirect effects of this measure will be to exalt the value of small craft for their knowledge that the battle fleet can neither be reinforced nor replaced in an emergency will certainly encourage the naval authorities to assign the smaller types of vessels a more important rôle in the general scheme of strategy and tactics than they have played up to now. Apart from a few capital ships which have either been withdrawn from the Atlantic or Mediterranean fleets or temporarily paid off for repairs, the reserve fleet will henceforth consist chiefly of aircraft-carriers, light cruisers, destroyers, and submarines. If the necessary funds were available for organizing periodical exercises by this force, in co-operation with the active battle fleet, our senior officers would gain much valuable experience in the tactics which are likely to govern naval operations in the new era, but it is to be feared that there will be no money to spare for this purpose.—*Naval and Military Record*, 19 April, 1922.

**IMPERIAL AIRSHIP SERVICES.**—Just in time to prevent the carrying out of the government's announced intention to dispose of our remaining airships, an offer to take them over and use them for the establishment of an imperial airship service was received from Commander C. D. Burney, supported by Vickers, Limited, and the Shell oil group. The scheme submitted contemplates at the outset a bi-weekly service to India, and later on an alternate-day service to India, with a weekly extension to Australia. The government is to hand over free of cost the four airships in its possession, all airship material and the airship bases, to supply wireless telegraphy and meteorological services, and to guarantee—in conjunction with the governments of India and Australia—the interest on the capital involved. The vessels taken over, it is proposed, should be used for

training and short journeys only, five new vessels of 3,800,000 cubic feet capacity being constructed for regular use on the extended routes. These vessels would have a maximum speed of 70 knots, but taking the average speed at 40 knots, they would enable Bombay to be reached in five and one-half days, and Perth, West Australia, in eleven and one-half. The promoters of the scheme believe that the services, after an initial experimental period, would become self-supporting, and finally show a good profit. They are not deterred by recent airship disasters, for they argue that they could have been prevented. In the case of *R-38*, they say, the disaster was caused by certain errors in the design, and, moreover, the performance demanded of the ship was far in excess of that required of a commercial vessel. The *Roma*, they urge, was lost because she was being subjected to speed trials at a height above the ground so low that it allowed no opportunity for recovery from even a trifling mishap.—*The Engineer*, 7 April, 1922.

THE FUTURE OF MALTA.—Although there has been no confirmation of the report current a few weeks ago that Malta was about to be placed under the admiralty jurisdiction, the government is known to be considering the administrative future of this island fortress, and it is not impossible that a change such as that indicated will be announced during the year. When the post of governor became vacant in 1919 it was widely rumoured that a naval officer would be appointed as the new incumbent, but in the end the choice fell upon that distinguished soldier, Field Marshal Lord Plumer. By all the rules of logic the governance of Malta should be in naval hands, for the strategic importance of the island is essentially maritime. It is a fleet base pure and simple, and responsibility for its defence in time of war would rest entirely on the navy. Unfortunately it is not the custom in this country to determine such matters on logical principles, and so, with our usual disregard for the fitness of things, we have had a succession of military governors for our most important naval strongholds. Nevertheless, it is believed that a break in this tradition is contemplated in the interests of economy, and that the next governor of Malta will be a naval officer.

Drastic cuts have already been made in the dockyard there, but we do not suppose there is any intention of allowing the station to deteriorate as a repairing base for the fleet. When the lords commissioners of the admiralty made their last inspection of Malta before the war they announced their purpose of "making full use of the facilities of this important and complete naval base, the value of which to the British navy is of a permanent character." It was further stated that such proportion of refitting and repair work would be assigned to the dockyard as to keep it in a normal condition of activity, thus rendering it at all times capable of attending to the needs in peace or war of any naval force cruising or operating in the Mediterranean.—*Naval and Military Record*, 5 April, 1922.

BRITISH AIR POLICY.—A question much discussed lately—to what extent developments in aviation may make naval warfare obsolete—was raised in the House of Commons March 16 in a debate on the naval estimates. Austin Chamberlain, Lord Privy Seal, outlined the present policy of the government on the question.

Mr. Chamberlain said he could imagine circumstances might soon lead the world to believe that limitation of battleships or armament would be of little use unless similar limitation was placed on aircraft. Therefore, he could only declare the government's policy as things stood at present.

Believing, as the government did, that the air force had immense potentialities, quite distinct from its duties as an adjunct to the naval and military services, and convinced that in the future the greatest danger to Great Britain might well be from an action by air forces, the government considered it would be a retrograde step to abolish the air ministry and re-absorb the air force into the admiralty and the war office.

Mr. Chamberlain announced that the standing committee of the committee on imperial defense, after long and careful inquiry, had arrived at the following conclusions:

First—That the air force shall be autonomous in matters of administration and education. Second—In case of defense against air raids the army and navy must play a secondary rôle. Third—In case of military or navy operations the air force must be in strict subordination to the general or admiral in supreme command. Fourth—In other cases, such as the protection of commerce and an attack on enemy harbors and inland towns, the relations between the air forces and the other services shall be regarded as a matter of co-operation.

Mr. Chamberlain added that the government had decided to appoint a committee to advise further how to secure the utmost efficiency in the air service.—*Aerial Age Weekly*, 3 April, 1922.

AIR ESTIMATES.—The following table gives an abstract of the air estimates, which were issued last week. The estimates show a net reduction on last year's figures of £7,516,477, the total for the coming year being £10,895,000. A reduction in the numbers of the R. A. F. by 9,704 is provided for.

	1922-23	1921-22	Decrease
Effective Services:	£	£	£
Pay, etc. ....	3,781,000	4,084,010	1,023,010
Quartering Stores, Supplies, and Transport. ....	1,530,000	3,105,000	1,575,000
Technical and War-like Stores. ....	1,295,000	3,758,000	2,463,000
Works, Buildings, and Lands. ....	1,826,000	3,018,000	1,192,000
Air Ministry. ....	680,000	915,467	235,467
Miscellaneous. ....	85,000	191,000	34,000
Civil Aviation. ....	(a) 364,000	(a) 880,000	516,000
Research. ....	(a) 1,177,000	(a) 1,706,000	59,000*
Total Effective Services. ....	10,738,000	18,305,477	7,567,477
Non-effective Services:			
Half Pay, Pensions, etc. ....	(b) 157,000	(b) 106,000	*51,000
Total. ....	10,895,000	18,411,477	7,516,477

\* Increase.

(a) Includes certain non-effective charges in respect of these Services.

(a) Includes certain non-effective charges in respect of these services, and experimental and research services. Those are included under votes 8 and 9 respectively.—*Army, Navy, and Air Force Gazette*, 25 March, 1922.

THE LOSS OF SUBMARINE "H-42."—At 9:30 in the morning of the twenty-third of the month the British submarine *H-42* was rammed and sunk by the destroyer *Versatile*, with the loss of all hands. The submarine was engaged in exercising off Europa Point, Gibraltar, and it appears that she came to the surface but a few yards ahead of the destroyer, which was steaming at twenty knots. There was no time to alter course sufficiently to avoid a collision, and the submarine was struck at right angles just abaft the conning tower. The *H-42* belonged to Portsmouth and was

attached to the submarine dépôt ship *Maidstone*. She was a vessel of 440 tons surface displacement and 500 tons submerged, her dimensions being 171 ft. long overall, beam 15 ft. 6 in. and draught about 14 ft. She was built by Sir W. G. Armstrong, Whitworth and Co., Limited, in 1918, and her engines were constructed by Ruston and Hornsby. Her surface speed with 480 horsepower was thirteen knots, and submerged with 320 shaft horsepower she could make twelve knots. She had on board at the time of the disaster twenty-six officers and men.—*The Engineer*, 7 April, 1922.

SIR ROSS SMITH AND LT. BENNETT KILLED.—A terrible air disaster occurred at Weybridge on Thursday, in which Sir Ross Smith and Lieutenant Bennett lost their lives.

Sir Ross Smith, with the assistance of Sir Keith Smith and Lieutenant Bennett, was to have started on an attempt to make the first aerial journey around the world on April 25.

Sir Ross Smith was a noted airman. With his brother, Sir Keith Smith, he won the Australian government's £10,000 prize for a flight from England to Australia. The brothers were made Knights of the British Empire in recognition of this pioneer flight. Sir Ross Smith in 1914 sailed with the first Australian troops as a trooper. He won his commission in Gallipoli and after serving in Egypt in 1916, joined the Australian squadron of the royal flying corps and saw service in Palestine. After the armistice he was sent with General Borton to survey the route between India and Australia.—*Naval and Military Record*, 19 April, 1922.

PROPORTION OF OFFICERS TO BE RETIRED.—Delay in issuing the scheme of retirement for naval officers is, says *The Times*, "due to the difficulty experienced in adjusting the fair and reasonable claims of the officers as set forth by the admiralty board with the limits which the treasury consider to be fixed by the urgent demands of economy. The number of officers to be retired has been under-estimated.

It was assumed when the admiralty announced that the flag list was to be reduced by one-fifth that somewhere about this proportion would rule in the case of the ranks, next below, and that there would be nothing like differential treatment. It is understood now that the proportion of captains and commanders to be retired will be more nearly one-third than one-fifth, or, roughly, 120 of the former and 200 of the latter rank.

The case of the junior officers will be still worse, as, owing to a decision not to retire any of the 600 lieutenant commanders, a large proportion of lieutenants must be sacrificed, and it is estimated that from one-half to three-fifths may have to go. Several hundred young officers will have to seek a new career.—*Naval and Military Record*, 19 April, 1922.

RETIRED PAY.—A fleet order states that the board have had under consideration the rates of retired pay to be granted to officers of the rank or relative rank of lieutenant commander or lieutenant who are retired for non-service under the age of forty years; provision for such cases not having been made in the revised scales of retired pay promulgated in M. O. 2483a/19.

The following rates have been approved for lieutenant commanders and lieutenants and officers of corresponding ranks in the engineer and accountant branches, exclusive of: (a) Officers on the supplementary list; (b) officers promoted from the rank of mate or mate (E); (c) officers formerly of warrant rank, promoted for long and zealous service; (d) officers, formerly of warrant rank, promoted for acts of gallantry or daring; (e) officers specially promoted to the rank or corresponding rank

of lieutenant during the war from warrant rank or commissioned officer from warrant rank.

Such officers if retired for non-service under the age of forty will be granted retired pay at the rate of £75 a year, with an addition of £7 10s. a year for each of the first six complete years' service, and an addition of £12 10s. for each complete year of service subsequent thereto in the ranks or relative ranks of lieutenant and lieutenant commander. Unemployed time and half-pay time will count as one-third for the purposes of the above scale.

The above rates of retired pay will be subject to review on or after July 1, 1924, in accordance with paragraph 41 of M. O. 2483a/19. The foregoing arrangements will have effect as from April 1, 1919.

The rates of retired pay to be granted on retirement for non-service at ages under forty to officers of the rank or relative rank of lieutenant commander or lieutenant who are not included in the scope of this order are under consideration and will be promulgated in due course.—*Naval and Military Record*, 12 April, 1922.

BRITISH EXHIBITION SHIP TO SAIL NEXT MONTH.—The steamer *Orontes* of 9,020 gross tons, heretofore engaged in the Australian trade, has been sold by the Orient line to a syndicate which is planning to convert her into an exhibition ship immediately. She is to be renamed the *British Trader*, and is scheduled to sail at the beginning of May on an eight-months' cruise covering 40,000 miles.

Comparatively few alterations are to be made in the vessel. It is intended to utilize the present extensive first and second-class accommodations as living quarters and offices, while the steerage quarters and 'tween decks and holds are to be fitted up with 300 exhibition booths or stalls. Particular attention is to be paid to the machinery and motor trades.—*Nautical Gazette*, 22 April, 1922.

"MAJESTIC" REACHES SOUTHAMPTON.—The giant liner *Majestic*, the largest ship in the world, arrived at Southampton on Monday last and will be delivered to the White Star line during the course of the week. On her trial run in the North Sea she proved herself ready for service in every respect, developing an average speed of 23 knots and 68,000 indicated horsepower.—*Nautical Gazette*, 15 April, 1922.

LLOYD'S SHIPBUILDING REPORT FOR FIRST QUARTER.—According to *Lloyd's Register of Shipping*, 955 merchant vessels of 3,679,622 gross tons were under construction at the end of March in the various maritime states except Germany. The showing by countries is as follows:

Country	No.	Gross Tonnage
Belgium.....	7	17,313
Brazil.....	1	2,170
British Dominions.....	38	63,502
China.....	7	8,170
Denmark.....	26	61,738
Estonia.....	20	6,531
Fiume District.....	9	7,859
France.....	60	286,255
Greece.....	1	600
Holland.....	109	258,240
Italy.....	96	311,888
Japan.....	26	117,312
Norway.....	32	49,534
Portugal.....	14	5,983
Spain.....	13	54,707
Sweden.....	28	55,556
United Kingdom.....	437	2,235,998
United States.....	31	136,266
Total.....	955	3,679,622

Details of motorship construction are given in the next table:

Country	No.	Gross Tonnage
Brazil.....	1	2,170
British Dominions.....	1	100
Denmark.....	7	29,808
Estonia.....	7	2,491
Fiume District.....	2	600
France.....	1	8,500
Greece.....	1	600
Holland.....	14	13,550
Italy.....	24	23,308
Japan.....	1	310
Norway.....	4	13,620
Portugal.....	3	1,700
Sweden.....	13	42,830
United Kingdom.....	29	133,991
United States.....	6	19,945
Total.....	104	293,523

The number of tankers under construction at the end of March, 1922, is shown in the following table:

Country	No.	Gross Tonnage
British Dominions.....	2	11,600
Fiume.....	2	3,284
France.....	6	40,460
Holland.....	3	9,766
Italy.....	7	41,800
Japan.....	3	18,400
Sweden.....	1	5,450
United Kingdom.....	64	416,654
United States.....	7	67,976
Total.....	95	615,390

—*Nautical Gazette*, 29 April, 1922

## JAPAN

JAPANESE NAVAL CONSTRUCTION.—Although the Naval Limitation Treaty has not yet been ratified by Japan, work was cancelled as early as last February on the capital ships which are surplus to the agreement. This is evident from a statement issued early in that month by the Mitsubishi yard at Nagasaki, to the effect that in compliance with instructions from the authorities work must cease forthwith on the battleship *Tosa* and the battle cruiser *Takao*. Keen disappointment is expressed that the yard should thus be deprived of the opportunity of demonstrating its skill in equipping and completing the *Tosa*, which was launched a few months ago as the largest battleship in the world. This sentiment will doubtless be shared by the workmen in general, but their disappointment, the statement adds, will be mitigated when they remember that the decision has been prompted by a desire to promote the world's peace. Full preparations were being made at the Nagasaki yard for the building of further vessels similar to the *Tosa* and *Takao*, and the order to suspend these plans has created serious difficulties, as there is not nearly sufficient alternative work to maintain the number of men at present employed. A statement has also been issued by the Kawasaki yard at Kobe, where instructions were received on February 5 for the stoppage of all work on the battleship *Kaga* and the battle cruiser *Atago*. The former was then considerably more than half completed, and wanted only her armor, guns, and equipment. In the case of the *Atago*, however, the work done was limited to laying

the keel and assembling material. In order to avoid discharging the 3,000 men who had been engaged in the construction of these two ships, the yard management has decided to put them to work on two destroyers and twelve submarines, as well as on the light cruiser *Kinu* and the very fast cruiser *Jintsu*, which are already building there. In addition, two special service ships ordered by the navy for completion in 1925-26 are to be accelerated.

Unemployment threatens to assume such serious proportions in the Japanese shipbuilding industry that the various yards which undertake admiralty work are considering a scheme for pooling current and impending contracts for cruisers, destroyers, submarines, and auxiliaries, and allotting to each yard a share of work proportionate to its capacity. Should this scheme be adopted, it may be extended also to mercantile tonnage, for it is realized that exceptional measures will have to be taken if the national shipbuilding industry is to survive the crisis which has been brought about by naval disarmament.

The nine yards which at present have admiralty contracts on their books are the Mitsubishi, Kawasaki, Kobe Steel Works, Uruga Dock, Asano, Osaka Iron Works, Ishikawajima, Fujinagata, and Mitsui. Between them they employ 60,000 hands, and have sufficient material in stock to build 300,000 tons of shipping. The majority have enough work to carry them over this year, but after that they will not need more than half their present number of hands.

The light cruiser *Yura*, laid down at Sasebo dockyard in May last, was launched on February 15. Very little is known about this ship, which may be either a replica of the *Kuma* class, displacing under 6,000 tons, or the first of a new and heavier type of fast cruiser which the Japanese navy is understood to be developing. Including the *Yura*, there are now at least eight cruisers building in Japan, and eight others have been authorized, while twelve such ships less than ten years of age are already in service. Japan is therefore far ahead of the United States and second only to Great Britain in a type of vessel the importance of which is universally acknowledged.

In February last a collision took place between the light cruiser *Tenryu* and the second-class destroyer *Tsuta*. The latter, which had been completed only a few weeks previously, was seriously damaged.

In accordance with the Limitation Treaty the following ships have been ordered to be withdrawn from service with a view to being broken up: battleships *Shikishima*, *Asahi*, *Mikasa*, *Hizen*, *Katori*, *Kashima*, *Satsuma*, *Aki*, and the cruisers *Ikoma*, *Ibuki*, and *Kurama*. The *Mikasa*, however—Togo's famous flagship during the war with Russia—is to be moored at Yokosuka as a souvenir.—*Naval and Military Record*, 12 April, 1922.

JAPAN'S DEFENCE POLICY.—Now that the Anglo-Japanese Alliance has ceased to operate and its place has been taken by a treaty which investigation shows to be no effective substitute for the former defensive and offensive league which had existed between this country and Japan for twenty years, it is not surprising to learn that the Japanese naval and military authorities are endeavoring to adjust their defensive plans to the new strategic conditions with which they are faced. Since the wording of the Pacific Treaty, and particularly of the reservation inserted by the American Senate, makes it clear that the signatory parties are under no obligation to take up arms in defence of the principles enunciated in the document, Japan argues that she must henceforth rely entirely upon her own strength for the protection of those interests which she considers vital to her existence. According to messages from Tokio received early



in the present month, the military and naval general staffs have taken counsel together, and, in view of the Washington agreement, limiting the fortification of islands in the Pacific to the *status quo*, have resolved to make certain changes in their traditional policy. In future, therefore, the cordon of defence, which formerly extended well into the Pacific Ocean, will be reduced to a much narrower limit, and while maintaining such forces afloat and ashore as will be adequate to guard her coasts against attack from the west, Japan will pay special attention to securing her communications with the Asiatic mainland, whence in time of war she would have to draw no inconsiderable part of her foodstuffs and other essential supplies.

The news of this readjustment of defence policy has been interpreted in some quarters as an announcement of Japan's intention to extend her political and economic hold over China in order to compensate for the restrictions which the Washington agreement has placed upon her naval expansion. Time must show whether this reading of the facts is correct, but it seems premature at this stage to accuse Japan of contemplating a line of action that would be difficult to reconcile with the spirit of the treaties to which she has set her signature. Her strategical problems are in many aspects similar to those which we ourselves have had to solve in the past and may have to solve again in the future. As an island state, with important colonial possessions, she is primarily dependent on naval power for security against attack, and ever since she emerged from centuries of hermit-like seclusion to take her place in the ranks of the great powers, her aim has been to maintain a fleet sufficiently strong to ensure her supremacy in the Sea of Japan and its adjacent waters. This object she finally achieved after the war with Russia, since when no power has maintained in the far east a naval force comparable in strength with the Japanese fleet; while Japan on her part has done her utmost to discourage the creation of foreign naval bases on her side of the Pacific, realizing as she did that so long as such bases were non-existent she would have little to fear from attack, even by a would-be aggressor whose combined naval resources were far superior to her own.

A few years ago, however, the United States seemed disposed to establish large naval bases in the Philippine and Ladrone Islands. Although little was said openly, it is known that Japan was gravely perturbed at the prospect of having as it were, the United States navy brought to within easy reach of her coasts, a development calculated to threaten that local command of the sea which she has always regarded as something to be maintained at all costs. While it might be too much to affirm that the execution of the American fortification scheme would have been regarded by Japan as a *casus belli*, it was very widely believed in the far east that war between the two countries would have become simply a matter of time if the Americans had persisted in their plan. Without some clause relating to these Pacific fortifications the Washington naval agreement would have been practically valueless as a safeguard against war, and, in fact, would probably not have been negotiated at all; for it has just been revealed by the Tokio newspapers that the Japanese delegates made it clear at the outset that they attached infinitely more importance to this question than to the scrapping of ships. It was only after the United States and Great Britain had agreed to the Japanese proposal regarding the suspension of all further work on the insular naval bases in the Pacific that Admiral Baron Kato felt himself free to accept Mr. Hughes's drastic scheme for reducing the respective ship establishments.

The abandonment of the projected American bases in the Western Pacific is, of course, an enormous gain from Japan's point of view, but it cannot be said to have absolved her from the necessity of keeping up a

naval force strong enough to deal with any fleet that might be sent to make flying raids on her coasts and communications. All impartial observers must admit that the battle fleet with which Japan has agreed to content herself under the terms of the treaty is modest enough in view of the important part which sea power plays in her scheme of defence. She retains only ten capital ships in all, and four of these are battle cruisers of a design more or less obsolete. This fleet is so small and the possibility of reinforcing it in an emergency so remote that Japanese strategists will probably regard it as a last card to be played only as a *dernier ressort*. Their tendency in future will be to rely more and more upon those smaller and cheaper factors of naval defence, such as cruisers, submarines, and aircraft, in regard to which the treaty leaves them a free hand. Indeed, it is already known that the construction of such types is to be pushed forward with all speed, partly to relieve the industrial depression caused by the stoppage of capital shipbuilding and partly, no doubt, to make up by a substantial margin in auxiliary craft for the weakness of the battle fleet.

As regards Japanese military policy, the principles that govern it are somewhat obscure, for in spite of there being at present no visible menace to the island empire, she is maintaining an army of twenty-one divisions, with very large reserves in the background. It is true that the government is now considering the disbandment of several divisions, but it has been made clear that the money saved thereby will be spent on improving the equipment of the reduced army, which is notoriously deficient in certain items, such as heavy mobile artillery and tanks, which the European war showed to be indispensable for the conduct of a major campaign. There will consequently be no reduction in the cost of the Japanese army, nor will the cut in naval expenditure be so great as might have been anticipated, as the cost of the additional cruisers, submarines, etc., which it is proposed to lay down at an early date will make a large hole in the gross amount saved by cancelling the battleship programme.

What effect, if any, this new orientation of Japan's defence policy will have on her attitude towards China cannot be clearly foreseen at the moment, but there is no reason to assume that it heralds any further absorption of Chinese territory. On the other hand, Japan undoubtedly means to hold what she already has in the way of political and economic advantages and those who suppose that in signing the various Washington treaties she formally renounced her privileged position in China are sadly deceiving themselves. Rightly or wrongly, the Japanese think that they have made quite enough sacrifices to please America and England, and they show no disposition to accept further dictation as to their defensive or foreign policy from any quarter whatsoever. And in any case, seeing that the ink on the treaties is scarcely dry, it will be well to wait a little before lecturing Japan on her supposed designs in East Asia. So far, at any rate, nothing whatever has happened to give grounds for the suspicion that she does not mean to observe with perfect loyalty all the pledges into which she has entered. Those who assert the contrary have evidently read into the treaties much more than they really contain, particularly the one that relates to future international activities in China.—*Naval and Military Record*, 19 April, 1922.

## UNITED STATES

NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR  
WASHINGTON, D. C.

April 10, 1922.

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—Progress as of March 31, 1922

Type Number and Name	Contractor	Per Cent of Completion			
		April 1, 1922		March 1, 1922	
		Total	On Ship	Total	On Ship
<b>BATTLESHIPS (BB)</b>					
45 <i>Colorado</i> .....	New York S. B. Cpn.....	90.7	90.	89.6	88.7
47 <i>Washington</i> .....	New York S. B. Cpn.....	75.9	70.3	75.9	70.3
48 <i>West Virginia</i> .....	Newport News S. B. & D. D. Co.....	78.	76.	74.	70.2
49 <i>South Dakota</i> .....	New York Navy Yard.....	38.5	31.6	38.5	31.6
50 <i>Indiana</i> .....	New York Navy Yard.....	34.7	27.2	34.7	27.2
51 <i>Montana</i> .....	Mare Island Navy Yd.....	27.6	19.	27.6	19.
52 <i>North Carolina</i> .....	Norfolk Navy Yard.....	36.7	27.1	36.7	27.1
53 <i>Iowa</i> .....	Newport News S. B. & D. D. Co.....	31.8	27.4	31.8	27.4
54 <i>Massachusetts</i> .....	Beth. S. B. Cpn. (Fore River).....	11.	4.3	11.	4.3
<b>BATTLE CRUISERS (CC)</b>					
1 <i>Lexington</i> .....	Beth. S. B. Cpn. (Fore River).....	33.8	24.2	33.8	24.2
2 <i>Constellation</i> .....	Newport News S. B. & D. D. Co.....	22.7	19.5	22.7	19.5
3 <i>Saratoga</i> .....	New York S. B. Cpn.....	35.4	28.	35.4	28.
4 <i>Ranger</i> .....	Newport News S. B. & D. D. Co.....	4.	1.5	4.	1.5
5 <i>Constitution</i> .....	Philadelphia Navy Yard.....	13.4	8.4	13.4	8.4
6 <i>United States</i> .....	Philadelphia Navy Yard.....	12.1	7.1	12.1	7.1
<b>SCOUT CRUISERS (LIGHT CRUISERS) (CL)</b>					
4 <i>Omaha</i> .....	Todd D. D. & Const. Cpn.....	99.2	94.8	99.2	94.7
5 <i>Milwaukee</i> .....	Todd D. D. & Const. Cpn.....	94.9	87.9	94.4	87.
6 <i>Cincinnati</i> .....	Todd D. D. & Const. Cpn.....	88.2	82.	88.1	81.8
7 <i>Raleigh</i> .....	Beth. S. B. Cpn. (Fore River).....	64.9	47.6	64.2	46.6
8 <i>Detroit</i> .....	Beth. S. B. Cpn. (Fore River).....	82.8	70.8	81.	68.1
9 <i>Richmond</i> .....	Wm. Cramp & Sons Co.....	89	82.	87.	80.
10 <i>Concord</i> .....	Wm. Cramp & Sons Co.....	85.	78.	83.	77.
11 <i>Trenton</i> .....	Wm. Cramp & Sons Co.....	59	47.	58.	46.
12 <i>Marblehead</i> .....	Wm. Cramp & Sons Co.....	47.	33.	47.	33.
13 <i>Memphis</i> .....	Wm. Cramp & Sons Co.....	40.	26.	40.	26.
<b>AUXILIARIES</b>					
Repair Ship No. 1, <i>Medusa</i> (AR1).....	Puget Sound Navy Yard..	79.3	70.8	77.6	69.8
Dest. Tender No. 3, <i>Dobbin</i> (AD3).....	Philadelphia Navy Yard..	69.9	69.6	68.1	67.8
Dest. Tender No. 4, <i>Whitney</i> (AD4).....	Boston Navy Yard.....	51.8	45.1	50.9	42.1
Sub. Tender No. 3, <i>Holland</i> (AS3).....	Puget Sound Navy Yard..	21.5	5.5	21.5	5.5
<b>PATROL VESSELS</b>					
Gunboat No. 22, <i>Tulsa</i> (PG22).....	Charleston Navy Yard..	72.7	61.3	72.3	60.
<b>DESTROYERS</b>					
*339 <i>Trever</i> .....	Mare Island Navy Yard..	99.8	99.8	99.8	99.8
340 <i>Perry</i> .....	Mare Island Navy Yard..	95.2	95.2	90.7	90.7
341 <i>Decatur</i> .....	Mare Island Navy Yard..	86.1	86.1	84.3	84.3

Destroyers authorized but not under construction or contract.

(12) Nos. 348 to 359 inclusive.

\*Ready for commissioning.

There are three fleet submarines and thirty-eight submarines under construction.

There are six fleet submarines and one submarine authorized but not under construction nor contract.

**NAVY INCREASES WIN BY LARGE MAJORITY.**—By an overwhelming vote of 221 to 148 the House on April 19 defeated the efforts of the "little" navy men and voted to fix the navy enlisted personnel at 86,000, as demanded by Secretary of the Navy Denby and urged by President Harding.

The committee recommendation of 67,000 enlisted men, which was so signally defeated on April 15, was up for a record vote and members on both sides of the question were eager for a decision.

The House for the first time in many days was crowded to the doors and the galleries were filled to capacity. It was a gathering marked by numbers of women visitors to the D. A. R. convention, Annapolis midshipmen and officers of the navy.

After reading the bill for amendment, Representative Kelley, chairman of the sub-committee on appropriations, alluded to by Representative Dupre of Louisiana as the "wrecker of the navy," demanded a record vote on the personnel sections and on the subsistence amendment offered by Representative Swing of California, as well as a vote on the McArthur amendment increasing the various items for the pay of the navy.

#### Vote Is Cheered

When the vote was read by the speaker prolonged cheering resulted and the navy group was confident that its fight for an adequate navy would be sustained by the Senate. The McArthur amendment and the Vare amendment increasing the personnel to 86,000 men, 80,000 enlisted men and 6,000 apprentices, was sustained by a vote of 221 to 148. The Swing amendment increasing subsistence allowances was adopted by a *viva voce* vote.

The House increased the appropriation for the temporary government of the Virgin Islands from \$250,000 to \$343,440 on an amendment proposed by Representative Towner of Iowa. No opposition developed.

The first snag encountered developed over the discussion of the maintenance of the Dahlgren Proving Grounds, Va. Mr. Stephenson of Ohio, who was opposed to any fresh expenditures, introduced an amendment providing that "no part of the appropriation (for the bureau of ordnance) or any other appropriation shall be available for expenditure for the navy proving grounds at Dahlgren, Va., except as much as may be necessary in continuing the establishment on a closed-down basis." This was adopted.

In a discussion of the appropriations for the bureau of aeronautics Mr. Hicks of New York proposed that the appropriation authorized (of \$5,475,000) by the committee be increased to \$7,093,000. He asserted that the increase would provide only the necessary equipment for aviation and would not permit of the expenditure of funds for great extensions.

#### Amendment Voted Down

The House apparently was in no disposition to contest the committee attitude, and after limited debate voted against the Hicks amendment, 75 to 34.

Chairman Kelley, leading the fight for reduced appropriation, explained that between \$8,000,000 and \$9,000,000 would become available for aviation purposes later that could not be provided in the naval appropriation bill. This sum, he said, would bring the total amount for this purpose up to approximately \$16,000,000.

Mr. Herrick, who has become somewhat of an interesting personality to naval officers stationed in and around Washington, and is a flier himself,

proposed an amendment to the \$400,000 appropriation advocated by the committee for aircraft and accessories in course of construction or manufacture to \$500,000. The amendment was for the purpose of building a government airplane factory to manufacture planes. This was lost on a *viva voce* vote.

An amendment by Mr. Lanahan of Texas proposed an appropriation of \$400,000 for a helium plant. This was agreed to without dissent.

When the section of the bill dealing with the naval academy was reached a general free-for-all fight ensued between the big and the little navy groups. Speeches delivered by members centered largely around the proposed action of the committee in reducing the number of members of the 1922 class of midshipmen who were to be commissioned.

#### Civilian Instructors Retained

An amendment which started things going, proposed by Mr. Denison of Illinois, authorized an increase in the appropriation for the pay of professors and instructors from \$346,500 to \$421,500. It was for the purpose of retaining in the service the civilian instructors at the academy who have contracts with the navy department for terms of years.

Mr. Denison charged that the committee was seeking to throw these instructors out and supplant them with regular officers of the navy. His arguments finally won out after the House had fought over the proposition for nearly one hour and a half. Another amendment proposed by Mr. Denison was lost by a vote of 85 to 53. It provided that "no part of any sum in this act shall be expended in the pay or allowance of any commissioned officer of the navy detailed for duty as professor or instructor at the U. S. Naval Academy to perform the duties which were performed by civilian professors or instructors on January 1, 1922." This amendment would have produced the situation that no officers may be used as teachers in places provided by civilians.

In discussion of the naval academy needs the House engaged in a lively fight on the personnel section, Messrs. Kelley, Longworth of Ohio, Rogers of Massachusetts, and others participating.

#### Secretary Denby's Letter Read

Mr. Rogers demanded that Mr. Kelley produce Secretary Denby's letter showing the increases in appropriations that were called for under the increased personnel. Mr. Kelley balked and attempted to deflect the demand, but cries of "Read," "Read," came from members from various parts of the House, and he was forced to read the letter.

After an analysis of it by Mr. Mills of New York, Secretary Denby's letter showed that the increases would amount to approximately \$39,500,000. But he contended that of this sum \$19,000,000 was for increases called for in other sections of the bill which did not go into the personnel item.

"It's money got for increased activities of the navy because of the increased personnel," responded Mr. Kelley. He was drowned out, however, and the Denby letter, it was thought, swung the vote in favor of the increased personnel.

Reading of the bill was resumed and much progress was made until Mr. Byrnes of South Carolina sought to amend the section dealing with the increase in the navy by having stated in figures the amount of money necessary to be expended, which he said was \$46,250,000.—*Army and Navy Journal*, 22 April, 1922.

**\$3,000,000 PROJECT AT MARE ISLAND.**—The navy bill as reported to the House contains an appropriation of \$750,000 to be immediately available to meet an emergency of a serious character that has arisen at the Mare

Island navy yard and which requires rebuilding timber wharves and quay walls with repair to dykes, to cost, according to an estimate of the bureau of yards and docks of the navy department, \$2,800,000. Secretary Denby recently convened for the investigation of the situation at Vallejo a special board composed of Rear Admiral H. H. Rousseau, Captain F. P. Chambers, Commander George A. McKay, and Lieutenant Commander H. D. Rouzer, C. E. C. The condition at Mare Island on which the board was called upon to report arose from the presence of marine borers, principally the teredo, in San Pablo Bay and Mare Island Strait, within the last few years, that have attacked all wooden structures in those waters. Prior to 1913 the borers had never been reported in San Pablo Bay, and until September, 1919, there had been no evidence of damage from this source in Mare Island Strait proper according to navy yard authorities. Naturally, therefore, up to that time all wooden structures, both in San Pablo Bay and Mare Island Strait had been constructed of uncreosoted material, as the increased cost of creosoted material would not have been justified. The board examined the recent reports in the bureau files on the condition of the dykes, sea walls, wharves, etc., at the Mare Island yard, from which it learned that these dykes, quay walls, wharves, and various other waterfront construction of untreated timber have been damaged to such a degree within the last two and one-half years that portions have already collapsed, and the bulk of the remaining works are in imminent danger of failure, which may be expected to occur without warning at practically any moment. This condition is a serious menace to life and property and has necessitated placing certain portions of the navy yard waterfront structures out of commission. The report of the board stated as its unqualified opinion that there is only one course open in the way of remedy and that is to repair and replace the damaged structures with construction that will not be affected by marine borers, so as to maintain Mare Island on the same plane of importance and usefulness as before its structures were attacked, adding: "No lowering of this plane or lessening of the usefulness or facilities of the yard should be contemplated." It is proposed to expend \$1,500,000 in rebuilding wharves and quay walls and \$1,300,000 for repairs to dykes. The board also recommended that every effort be made to secure appropriations as quickly as possible, and it was with this information in his possession that Rear Admiral L. E. Gregory, chief of bureau, urged the appropriation of \$750,000 as an initial expenditure.—*Army and Navy Register*, 15 April, 1922.

**FATE OF NAVAL RESERVE FLIERS.**—Charges that naval reserve flying officers were "thrown out like so much junk" by heads of the naval air service were made by Senator Walsh, Massachusetts, before the Senate naval committee, at an investigation of his allegations of unfairness by the navy in the examination given the reserve fliers. His resolution, adopted in December, asserted that the examinations for transfer were unfair and unreasonable and held that the individual ability of the officer was not given consideration.

Detailing his charges before the committee, the Massachusetts senator said that about 200 officers, mostly volunteers during the war, were about to be forced out of the navy because they had failed in examinations for which they had no opportunity to prepare and which included subjects wholly unrelated to aviation.—*Aviation*, 17 April, 1922.

**BOARD'S MARCH DEFICIT.**—The operating deficit of the shipping board was \$3,704,155 last month as compared with \$3,089,459 in February. The poorer showing is attributed to March being a longer month, with total voyages of 183, against 155 voyages in February.

The excess of outlay over income on voyage operations, excluding overhead, repairs and insurance, was \$1,019,860, as against \$593,290 for February.—*Nautical Gazette*, 29 April, 1922.

**MARCH SHIPBUILDING OUTPUT IN DETAIL.**—The bureau of navigation, department of commerce, reports 62 sailing, steam, gas and unrigged vessels of 6,203 gross tons built in the United States and officially numbered during the month of March, 1922, as follows:

	Atlantic and Gulf		Pacific		Great Lakes		Western Waters		Total	
	No.	Gross	No.	Gross	No.	Gross	No.	Gross	No.	Gross
<b>WOOD</b>										
Sailing.....	3	1,314	..	.....	..	.....	..	.....	3	1,314
Steam.....	..	.....	..	.....	..	.....	1	75	1	75
Gas.....	35	991	9	350	2	33	..	.....	46	1,374
Unrigged.....	7	1,941	2	354	..	.....	..	.....	9	2,295
Total.....	45	4,246	11	704	2	33	1	75	59	5,058
<b>METAL</b>										
Sailing.....	..	.....	..	.....	..	.....	..	.....	2	831
Steam.....	2	831	..	.....	..	.....	..	.....	2	831
Gas.....	1	314	..	.....	..	.....	..	.....	1	314
Unrigged.....	..	.....	..	.....	..	.....	..	.....	..	.....
Total.....	3	1,145	..	.....	..	.....	..	.....	3	1,145
<b>TOTALS</b>										
Sailing.....	3	1,314	..	.....	..	.....	..	.....	3	1,314
Steam.....	2	831	..	.....	..	.....	1	75	3	906
Gas.....	36	1,305	9	350	2	33	..	.....	47	1,688
Unrigged.....	7	1,941	2	354	..	.....	..	.....	9	2,295
Grand Total	48	5,391	11	704	2	33	1	75	62	6,203

The above total includes 21 rigged vessels of 643 gross tons and 6 unrigged vessels of 1,430 gross tons, total 27 vessels of 2,073 gross tons built in years previous to 1922. There were not any steam or gas vessels of 1,000 gross tons and over built during the month of March, 1922.—*Nautical Gazette*, 15 April, 1922.

**U. S. NEEDS MERCHANT FLEET OF 7,500,000 TONS.**—On the supposition that the American merchant marine should be in a position to handle sixty per cent of our total water-borne commerce, the shipping board figures that on this basis there would be required a fleet composed something as follows:

	Gross Tons
Cargo ships and passenger and cargo ships.....	5,700,000
Tankers.....	1,400,000
Express passenger ships.....	400,000
Total tonnage.....	7,500,000

In explaining how this result was arrived at, the shipping board, in an official statement, said that the figure of 5,700,000 gross tons of cargo ships was arrived at by a method of proportion using actual figures of present operating vessels. As a check against this method we may compute the tonnage required from the purely theoretical standpoint, estimating the distribution of our exports and the number of voyages per year in the various routes. This would give a table something as follows:

Route	Tons Exports	Voyage Per Year	Voyage Tons
Middle America .....	4,500,000	10	450,000
United Kingdom & Atlantic Europe .....	8,500,000	5	1,700,000
Baltic, Mediterranean, Europe, W. C. S. A. ....	19,500,000	4	4,875,000
East C. S. A., Trans-Pacific, etc. ....	4,500,000	3	1,500,000
Long hauls, indirect, etc. ....	3,000,000	2	1,500,000
	40,000,000		10,025,000
One-half. ....	20,000,000		5,013,000
			Deadweight
With assumed attainable efficiency of 60 per cent of total dwt. per voyage, it would require. ....			8,333,000
Converted to gross. ....			5,600,000
Plus tankers. ....			1,400,000
Plus express passenger ships. ....			400,000
Total gross tons of ocean-going ships. ....			7,400,000

—*Nautical Gazette*, 15 April, 1922.

PERCENTAGE OF JANUARY'S TRADE CARRIED IN U. S. SHIPS.—According to figures compiled by the department of commerce, American flag vessels carried 32.99 and 38.99 per cent respectively of the ocean-borne imports and exports of the United States during the month of January. As regards tonnage entered and cleared 50.4 per cent of all merchant ships entering American ports flew the Stars and Stripes, while 51.45 per cent of those clearing were of United States registry.

In January a year ago American vessels carried 39 per cent of the imports and 36 per cent of the exports. The better showing in the export trade last January is said to be due to the Russian relief movement.—*Nautical Gazette*, 1 April, 1922.

PANAMA CANAL TRAFFIC.—During February 212 commercial vessels of 710,548 net tons passed through the Panama Canal carrying 838,074 tons of cargo. In the corresponding month of last year, 241 ships of 764,519 tons and carrying 882,313 tons of cargo passed through the waterway. The showing by countries was as follows:

Nationality	No. of Ships	Net Tons	Tons of Cargo
British .....	74	255,414	276,073
Chilean .....	5	8,926	4,534
Danish .....	2	6,569	10,610
Dutch .....	4	11,042	16,773
French .....	5	16,040	17,430
German .....	6	18,846	18,061
Japanese .....	9	40,220	57,176
Italian .....	2	5,822	1,110
Norwegian .....	9	26,185	40,337
Peruvian .....	4	6,042	4,453
Swedish .....	4	7,018	11,388
United States .....	88	308,424	380,129
Totals .....	212	710,548	838,074

—*Nautical Gazette*, 22 April, 1922.

SUGGESTED CHANGES IN U. S. NAVIGATION LAWS.—The shipping board has made public the findings of the Franklin committee on revision of navigation laws, which for some unknown reason has been kept secret for two years. The recommendations are unimportant, holding that the laws as they exist should be changed in minor details but that they do not constitute as serious a handicap to American shipping as they have been represented to be.

Among other features the board recommends a codification of our navigation laws and the issuance of more lenient regulations by the steamboat



inspection service. It also advises that Section 13 of the Seamen's act be amended so as to reduce the preliminary service required before men are to be rated as able seamen and the percentage of able seamen required in the deck crews.

A change is also suggested in the section of the La Follette act requiring masters to pay sailors half of their wages, which should be amended so as to reduce the prescribed payment to one-quarter of the wages due. Only one payment should be made in the same harbor on the same entry. It is also urged that seamen be provided with continuous discharge books. —*Nautical Gazette*, 8 April, 1922.

**PRESENT STATUS OF BOARD'S STEEL VESSEL FLEET.**—In his address on Tuesday to the joint congressional committee on behalf of the administration's ship subsidy bill, Chairman Lasker said that the government-owned steel fleet is divided as follows: Passenger ships, 500,000 tons gross; freighters, 6,000,000 tons gross; tankers, 550,000 tons gross.

Of the passenger ships, 300,000 tons are ex-Germans, of which 140,000 tons are so old as to be of no potential continuing value; their life is but short, and they can be, by and large, only academically considered an asset. Of fast cargo ships, we have but 15 ships of a total of 116,000 gross tons.

In passenger tonnage, both governmental owned and privately owned and including ships designed for the short runs to the West Indies, we have but 80 good ships, aggregating 600,000 tons; while of fast cargo ships of both classes we have but 53 ships of 390,000 tons.

To have a merchant marine that can effectively meet 50 per cent of all our peace-time carrying needs, we require a million and a quarter gross tons of passenger ships and about the same amount of the faster cargo ships.

Of our 6,000,000 tons of freighters, about half the steel tonnage is good tonnage, comparable to the best in the world. The other half ranges from fair to not usable for our purposes and should be either sold abroad for use in such trades where we have every assurance it will not find itself in competition with our ships, or dismantled.

Of the six million tons of freighters the government possesses, it is the hope of the shipping board that ultimately a great measure of the three million good tons will find itself in the hands of American owners, should the legislation now proposed be adopted. It is doubtful if, under the happiest conditions, the American flag will need the three million good tons in its entirety, and ways and means must be found to dispose of such of the good tonnage as remains, so that American interests will not be hurt.

Automatically the three million poor tons must be done away with. Part of it can be used by selling to Americans the hulls at low figures for conversion to types of freighters of which we are not possessed. The balance may either be sold in small quantities in local trades abroad if any, where, because of shorter runs and cheaper labor, local operation may be possible, or it must largely be dismantled.

In the genuinely competitive ocean-carrying trade in December, a normal month, American ships carried only 24 per cent of American exports. It is appalling to think that 19 per cent of this 24 per cent was carried in government-owned ships and only 5 per cent in privately-owned ships, when it is considered that the government, through the shipping board, admits its inability to operate on an equally efficient basis in competition with the private ships of the world.

We are carrying 87 per cent of the Mexican oil trade and 57 per cent of the Caribbean trade, but vessels designed for these trades are not of the types needed for naval auxiliary use in war.—*Nautical Gazette*, 8 April, 1922.

**PIERS AND BERTHING SPACES FOR SHIPS.**—In his report on water terminals and transfer facilities, Captain F. T. Chambers of the United States navy, says that in the United States by far the greatest percentage of berthing space for ships is in the form of piers, and beyond a doubt the present tendency to comparatively long and narrow row piers is a growth from conditions natural enough in the past, but now so far modified that those contemplating water-front improvements should weigh the facts carefully before deciding upon such construction.

The pier has an advantage over the wharf or quay construction in that it furnishes two berths, one on each side. Thus where little water front is available a much larger number of berths can be constructed upon the pier system than upon the quay system. It has the disadvantage that projecting at right angles, or nearly so, into the stream it is difficult to maneuver vessels into or from their berths except at slack water, with the further disadvantage that for modern ships of large capacity there is in general not sufficient width opposite the ship's berth for the accommodation of the enormous quantity of cargo which must be handled in and out.

Piers of moderate width are quite suitable for fitting out berths for ships at a shipyard, or even for accommodation of cargo of small vessels, but it should be borne in mind that within the past few years the sizes of ships have increased enormously, and that it is now considered that for overseas business ships of 10,000 tons deadweight capacity are the most economical.

The port of Jacksonville furnishes an effective comparison between pier and quay layouts for port terminal construction. The river at Jacksonville is none too wide for the manipulation of large ships, and had the city of Jacksonville in the early days acquired the entire water front on both sides of the river it would have made available about ten miles of water front for a port layout. The transit sheds would then have been built parallel to the water front and the railway brought in directly behind, with ample space reserved for classification and makeup yards. Furthermore, the largest ships could, under their own steam, have made their berths alongside the quay with ease, as they would have been pointed directly into the current.

Instead of this, industrial concerns for whose operation direct water-front connection is not essential, or which could under the quay system have been placed directly behind the railroad, quite as convenient to the water front as with the pier system, have acquired water-front property, and they, the railroads, and individuals have thrust narrow piers into the stream in the uneconomical American fashion.—*Nautical Gazette*, 28 April, 1922.

**LARGE LINERS SHOW PROFIT.**—According to T. H. Rossbottom, general manager of the United States lines, the steamships *America* and *George Washington* earned a profit of \$686,292 in the four months ending December 31 without making any allowance for depreciation or insurance charges.—*Nautical Gazette*, 22 April, 1922.

**LOS ANGELES DEVELOPING INTO GREAT OCEAN PORT.**—The last few years have witnessed a tremendous growth in the business of the port of Los Angeles. In 1919 its commerce barely reached 2,000,000 tons, while last year the total cargo movement approximated 4,800,000 tons. This was 500,000 tons more than in 1920.

Los Angeles is now connected by direct line with practically every port of importance in the world. In the last twelve months twenty-three new steamship services have been inaugurated out of the port. Of these the principal ones are the Compagnie Generale Transatlantique, to Havre;

the Robert Dollar line, to the Orient; the British India East Asiatic line, to Copenhagen and Hamburg; the Wilson line, to the United Kingdom and European ports; the Java-Pacific line, from Java and the Philippine islands; the Luckenbach Company's line, to Mobile and New Orleans; the Matson Navigation Company's line, to Hawaii; the Nippon Yusen Kaisha, to the Orient; the Isthmain line to Honolulu; the Diamond line to the United Kingdom and European ports; the American-Australasian line, to New Zealand and Australia, and the Struthers and Barry line, to Hawaii and the Orient. Every available slip and foot of dockage is now occupied and the city is engaged in spending millions of dollars widening the entrance to its harbor, building new wharves and dredging new channels to care for the business being offered.—*Nautical Gazette*, 15 April, 1922.

### AERONAUTICS

**PORTUGAL TO BRAZIL FLIGHT.**—Captains Sacadura Cabral and Gago Coutinho, of the Portuguese naval air service, have been forced to abandon their gallant attempt to reach Pernambuco, Brazil, when their seaplane was severely damaged upon beaching at St. Paul's Rock, in the South Atlantic, which the two fliers reached after a twelve-hour flight over a stretch of water devoid of any land.

The two fliers flew on April 17 from St. Vincent, Cape Verde Islands, to Porto Praya, in the same archipelago, a distance of about 200 miles, which they covered in two and one-half hours.

They left Porto Praya at 5:50 A. M. on April 18 heading for St. Paul's Rock, about 900 miles away, where they landed at 8 P. M. On landing the machine was unfortunately damaged to such an extent that it became impossible to resume the journey in the direction of Fernando Noronha, 350 miles away, whence only 378 miles separated them from the South American mainland.

The seaplane *Lusitania* which Captains Cabral and Coutinho were flying was, as has been foreshadowed in *Aviation*, the special type of Fairey floatplane which was recently launched in England.

This seaplane is a modification of the *Fairey C3D*, and has a span of 62 ft. and an overall length of 36 ft. 6 in. The engine is a 375 hp. Rolls-Royce "Eagle" and the fuel supply permits of a continuous flight of 18 hours. At the trials in England the machine developed a high speed of 95 m.p.h. with a wing loading of over 10 lb./sq. ft. and a power loading of 19 lb./hp., and the low speed 48 m.p.h. The weight empty is 4,150 lb., and the weight loaded 7,250.

According to latest advice, the Portuguese government has decided to ship a new seaplane to St. Paul's Rock so the two aviators may complete their flight to Brazil, a matter of 700 miles with one intermediate stop.—*Aviation*, 1 May, 1922.

**OUR STORED HELIUM SUPPLY.**—The helium plant at Fort Worth, Tex., was shut down December 1 last owing to lack of funds. At the time it was shut down, it had been operating in a fairly consistent manner, and had produced helium in notable quantities for a period of several months. The total production by this plant was about 2,100,000 cu. ft., and the total amount of helium which the navy has in storage is between 2,300,000 and 2,400,000 cu. ft. In one day (24 hours) the plant produced over 40,000 cu. ft. of helium.

There are still a few adjustments which are needed, and undoubtedly increased efficiency can be obtained in the future after further operation.

The army bill was recently presented to Congress with an appropriation of \$400,000 for helium. It is hoped that the navy bill will be reported out

with an equal amount, giving a total of \$800,000. If this amount is granted, it will be possible to operate the plant at Forth Worth the larger part of next year, and this should give an amount of helium sufficient to take care of immediate needs for both the army and the navy.—*Aviation*, 17 April, 1922.

MEETING OF N. A. C. A.—A complete and detailed study of the plans and specifications of the navy's rigid airship *ZR-1* was requested of the national advisory committee for aeronautics at its session on April 20 by Rear Admiral Wm. A. Moffett, chief of the naval bureau of aeronautics. Before the airship, whose parts are now being fabricated, but which has not yet been assembled, is completed, Admiral Moffett is desirous of having a thorough study made of all the stresses and strains it is likely to encounter in the air under service conditions and it is for this reason that he has asked the committee to appoint a special technical subcommittee of aeronautical experts and engineers to make a special study of its design and structure. While the navy is confident that its own plans for the airship are correct, it is nevertheless desirous of securing the opinion of an independent committee of experts to avoid the possibility of future adverse criticism. The whole committee approved Admiral Moffett's request and authorized its chairman, Dr. Walcott, to appoint a special technical subcommittee for this purpose.

Dr. J. S. Ames, chairman of the executive committee, reported on the progress made at the committee's research laboratory at Langley Field in the development of a new heavy-oil, fuel-injection aircraft engine for the bureau of aeronautics, navy department. While the details of the development are still held confidential, it is known that its use will greatly reduce the fuel fire hazard in aircraft. This new engine not only does away with the use of gasoline, but also operates without carburetor and spark plugs, thus eliminating certain causes of trouble.

Dawings and performance characteristic of a new high-speed airplane wing, just developed at the committee's laboratory, Dr. Ames stated, have been turned over to the army air service for use in the design of a new high-speed pursuit type airplane. This new wing is a thick wing section with space for internally bracing the wing and eliminating any wires or struts in the design of the airplane. The wing is both tapered in section and in plane form, conforming somewhat to the general shape of a bird's wing that is tapering toward the tip, both of which features add materially to the speed characteristics of the wing.—*Aviation*, 1 May, 1922.

SIX KILLED IN COLLISION IN FRANCE.—The first disaster on the commercial air routes between England and France occurred on Friday afternoon with the result that six people were killed and one person gravely injured.

The French machine was the *Goliath*, F. G. E. A. D., belonging to the Grands Express Airiens, which left Paris at noon under Pilot Hire, who was accompanied by a mechanic, with three passengers and goods, and when in the region of Thienloy St. Antoine, near Grand Villiers, it collided with the *De Havilland 18* machine G. E. A. W. O., belonging to the Daimler Hire, Ltd., which left Croydon for Paris at 10 o'clock with goods and mails, and was piloted by Lt. R. E. Duke, who is stated to have been accompanied by only a steward.

A telegram received by Le Bourget from the chief of the gendarmerie at Grand Villiers states that the accident happened at 1.20, and that both machines are completely destroyed. "Six are dead, and one is in a critical state," the message adds.

It is stated at the air ministry that at the time the collision is said to have taken place the visibility was fairly good, but there were low

clouds and light rain, and that possibly the machines were caught in a current.

Pilot Duke had a splendid flying record during the war, and had been for a long time engaged in civil aviation. He was a pilot in the Aircraft Transport Travel Co., which were the pioneers of commercial aviation, and had only recently joined the Daimler Co., immediately previous to which he was employed by the Royal Dutch Co. on the Amsterdam route.

The British machine formerly belonged to the air ministry, and was let on hire to the Instone air line. A few days ago she was acquired by the Daimler Hire Company, and this was her first flight under the new company.

The *De Havilland 18* was a single engine biplane, capable of carrying eight passengers and 500 lb. of baggage. She had an endurance of  $3\frac{1}{4}$  hours, giving a range of about 400 miles.

An official of Daimler Hire, Ltd., said last night that the machine had been on the Paris air service for over two years. "Owing to the delivery of our own machines not being up to date," he added, "the *De Havilland 18* was loaned to us by the air ministry. It is not one of the machines of the type that we are using in our passenger air service." She carried only mails and newspapers, and the only person on board, according to this official, was the pilot Duke.—*Naval and Military Record*, 10 April, 1922.

**THE USES OF AIRPLANE CARRIERS.**—The organization for naval air operations requires that many squadrons of airplanes can be put into the air at short notice, and naturally arrangements must be such that this can be done as promptly in a gale of wind as in fair weather. Airplane carriers answer this purpose because they are the only means by which airplanes may be used with the fleet in sufficient numbers and in all kinds of weather.

#### Airplane Carrier Is Floating Airdrome

Airplane carriers not only carry at sea a large number of planes—in other words, a much larger number that can be carried on the present type of ships—they also provide a means for getting them back after they have taken the air. Even if it were practicable to have planes land on the water alongside of a ship, with the idea of picking them up by means of a derrick, it must be remembered that in time of war the ships at sea must go at the maximum speed, and also zigzag. It was impracticable to pick up an ordinary boat under these conditions, and more impracticable to pick up a delicate airplane.

The radius of action of all planes, including bombers, is very limited, and bombing planes have to be protected by fighters. The airplane carrier is thus a large floating, mobile airdrome. It differs radically from the ordinary airdrome in that it is a means of putting into effect the offensive qualities of aviation, on which so many claims are being made, including a great many extravagant ones. The bombing of ships from shore, provided the ships come within the radius of action of land planes, is perfectly feasible and easy, but before this, the land plane, or whatever type of plane is used, must have a base from which to operate, at least in the present state of development of aviation.

A plane can take the air from the deck of a ship—using a catapult if the available length for take off is short—no matter how bad the weather may be. But a seaplane can take the air from the surface of the water only when the sea conditions are favorable; the sea must be smooth enough for the plane to be able to work up to flying speed while running on the surface. This means a water speed usually greater than the speed of the fastest trans-Atlantic steamer; consequently we cannot hope to improve matters very much by increasing the size of seaplanes; it is well known

that the state of the sea frequently forces the largest steamers to slow down.

#### Developed by Practical Experience

The airplane carrier has been developed by practical experience in naval air operations. At first, in the late war, seaplanes were carried on tenders from which they were hoisted overboard to take the air from the surface of the water. Used in this way the airplane was naturally unpopular with the navy, for, as explained above, it was of necessity a fair weather apparatus. The next step was to put airplanes with wheels on extemporized platforms built on tops of turrets of the fighting ships; this was a step in advance because the planes taking off from the platforms did not have to wait for smooth sea conditions, and consequently could operate in bad as well as good weather. But in this kind of operation, there was no satisfactory means of recovering the planes after flight, and there was not enough available space for platforms to permit operation of a sufficient number of squadrons. The next step was the carrier with a flying-on deck as well as facilities for flying off the deck. The use of carriers made it possible to increase the number of planes operating with the fleet, and made it possible to recover planes after they had finished their flights.

#### Catapult Supersedes Flying-off Platform

In the United States navy the flying-off platforms on turrets have been superseded by catapults which permit operation of more efficient planes from the fighting ships than was possible from the platforms. The length of run on the catapult is about the same as with the turret platform, but the mechanism of the catapult assists the plane to get up flying speed in the short run; consequently we can now use much faster or heavier planes than was possible with turret platform. The catapult also makes it possible to use planes on all types of ships, whether there be provision for this purpose or not.

Resuming it may be said that the airplane carrier is simply a means of furnishing transportation for planes over the sea, instead of restricting them to operations within a few miles of the shore. The putting of catapults aboard, and the placing of planes on ships, necessarily of a restricted number, is well enough, and in doing it the navy is doing the best it can with the means at hand. It is believed that battleship design will ultimately be radically modified so that they carry fewer guns, and the number of guns sacrificed will give a part of the deck space to planes, and re-arranged so that they can carry a greater number of planes. All wars are settled by gaining control of the sea, and this control is in the ultimate analysis generally gained by a fleet action, so that one must think of aviation as taking a rôle which in its own province, must on a very large scale, be decisive. Hence in order to carry planes in large numbers the airplane carrier is essential.—*Aviation*, 17 April, 1922.

"CURRENIUM"—WHAT IS IT?—Newspaper reports announce the production in Los Angeles of a new lifting gas, called currenium, which, it is claimed, is non-explosive and non-inflammable, and for which the further claim is made that its lift is essentially that of hydrogen.

In this connection George B. Harrison, formerly secretary of the Aero Club of Southern California, has favored us with the following communication, which is published for the sake of information.

"Currenium, a new gas which is non-explosive and non-inflammable and which can be manufactured cheaply, has been developed by the International Transportation and Manufacturing Co. It is the discovery of Dr. E. Curran, chief of the research department of that company. He has been experimenting for more than twenty years to devise a means of pro-

ducing a non-inflammable lighter-than-air gas, and in 1918 practically perfected such a process. Since then he has been developing the method of quantity production of the gas in order to attain a low priced method of manufacturing with the assurance of constant purity.

"A lift equal to that of 98 per cent hydrogen is claimed for the new gas, with a much better maintenance of purity than is possible with hydrogen. Dr. Curran has kept the gas in an airship compartment of his own design for more than a year without noticeable loss of purity. He asserts that the gas may be manufactured at less than \$40.00 per 1,000 cu. ft., and that its production is feasible whenever machinery can be installed.

"Tests of currenium have been made at Los Angeles, which were witnessed by members of Aero Club of Southern California and of the Commercial Aircraft Association of Southern California, in which a flame and electric spark were introduced into the gas without causing fire or explosion, and after which small balloons were filled to demonstrate its buoyancy. The actual lift of the currenium is almost that of hydrogen, but better than helium."—*Aviation*, 17 April, 1922.

THE WORLD'S NEW AIRSHIPS.—Major G. H. Scott, who commanded *R-34*, is one of the officers interested in the development of an imperial air service, whose naval and military usefulness is obvious. On this question of our own airships now for disposal he has some very clear views which have been put before the air conference recently. If not now, then in the immediate future, our own policy must be shaped by what other nations are doing with regard to airship work, and this Major Scott has tabulated.

Owing to the incentive of the war, the airship has been brought to that state of development where it may justly be said to take its place amongst the useful inventions of the world. Like all other engineering achievements which have reached such a stage, there can be no question of it standing still; it is certain great efforts will be made to establish it as a means of long distance transport, and to utilise it for defence purposes. British airships are in a peculiar position, says Major Scott. The British public really know little about their great possibilities, as although our existing airships are capable of carrying out long flights of three to four days, it has been impossible to demonstrate the commercial value and possibilities of this performance, as no ground organization is available outside Great Britain. The public in this country have seen nothing but the irregular, although long, flights carried out by our ships.

The airship position in this country has now reached a critical stage, and issues of vital importance to the empire depend upon the steps which we take now. There can be no doubt that the world will continue the development of the airship, and eventually airships will be flying commercially on all the main world routes. Major Scott holds the view that if a move is not made now one will be forced on us at no distant date, probably within two years. His reasons for thinking that if a move is not made now by this country, it will have to be made within two years, are based not on any revolutionary improvements in air ship design, but on the airship position in other countries.

The United States naval department have arranged with the Allies for the construction of an airship by Germany at the Zeppelin works as part of America's share of aerial reparations. This ship, we may take for granted, will embody the latest features of airship design, and should be flying within twelve months. The United States navy department are also building in America the *Z.R.I.*, modelled on a German ship. The U. S. Army have recently purchased an Italian semi-rigid ship, which is

the largest airship of its type in the world, and have also in commission several smaller non-rigid airships. With such a programme progress will be very rapid. A large base at Lakehurst has been erected; it has a shed with twice the floor space of anything in this country, capable of housing ships three to four times the size of any built to date. There are also several other bases in being and in use by the army and navy authorities, notably Langley Field. It is also known that a powerful commercial combine exists in America today, with a view to running commercial airships, probably in the first instance trans-continental—the Atlantic being considered a later development, says Major Scott.

The re-erection of three large sheds in France, which were taken from Germany under the peace terms, is proceeding. These sheds are being erected, one near Paris, one near Marseilles and one in Algiers. These, together with the two existing bases at Maubeuge and Marseilles, will place France in a very strong position, when she can finance the construction of ships (which undoubtedly is her present intention), both from an international traffic point of view and for the operation of an airship service from Paris to her principal colony. There is abundant proof that the Germans are firm believers in the future of airships. They have, in various ways, managed to keep their technical staff together, and are still in a position, technically, to design and construct airships. The latest move, and one which will give them what may well turn out to be a commanding lead in airships, is the arrangement now being completed between Spanish commercial interests and Zeppelin interests to establish an airship service between Spain and the Argentine. There is no reason why the first leg of this route, say, to Las Palmas, should not be operating within two years from now in spite of the fact that a shed must be erected in Spain, and quite possibly in this time the service may have reached Brazil. Italy recently constructed a 1½-million cubic feet semi-rigid, which America has purchased. They are now engaged in building a still larger airship of this type, which will have a range of about 4,000 to 5,000 miles. Italy also has under consideration a commercial airship service from Rome to her North African colony, Tripoli.—*Army, Navy and Air Force Gazette*, 22 April, 1922.

THE UNIFIED AIR FORCE VINDICATED.—Opponents of the idea of a single fighting air service, controlled by a separate air department, independent of, and co-equal in status with the war and navy departments will do well to ponder over the speech recently made in the House of Commons by Austen Chamberlain, speaking for the British government. The most important portions of this speech are reproduced elsewhere in this issue, but it seems worth while quoting here a few of its high lights, for they make clear why Great Britain does not intend to "wash out" her unified air force—as the admiralty had hoped would occur.

If the royal air force were to be reabsorbed by the army and navy, said Mr. Chamberlain, "sailors and soldiers would continue to think of the force in terms of their own service and would not pursue its development as an independent force outside the purpose with which it was associated, and for which they desire that it should be employed."

This is an argument which has been put forth many times, but we do not believe that it has ever before been expressed in such a clear and convincing language. And it was precisely because soldiers and sailors "thought in terms of their respective services," and not in terms of air warfare, that the British government created in the pressure of war the air ministry and the royal air force. "Until that time the air was purely under naval or military command, and was only thought of in terms of naval and military warfare," said Mr. Chamberlain, and it was only after the air ministry



was constituted with its air staff that "the aeronautical aspects of war were considered from an aerial point of view."

This was the situation which Great Britain found wanting in 1918 and remedied despite considerable opposition from the Senior Services. The opponents of the innovation then claimed that before long the unified air force would again be split up into its constituent parts and handed back to the war office and to the admiralty. Today, however, there can no longer be any doubt that the much criticized single air force idea was right. It is generally agreed that in the future hostilities will open up with a surprise attack from the air, and that this situation must be met by an air force which will consider the matter from an aerial and not a naval, or a military viewpoint. Hence the second conclusion the British government has arrived at with respect to national defense: *That in the case of defense against air raids the army and the navy must play a secondary rôle.* This means, in other words, that the royal air force is today Great Britain's first line of defense, while the navy is relegated to secondary place.

Students of national defense cannot afford to ignore the significance of the upheaval that has taken place in the traditions of a country which like Great Britain has for centuries chiefly relied on its naval service for keeping its shores inviolate of enemy attacks.—*Aviation*, 17 April, 1922.

AMUNDSEN TO TAKE AIRPLANES TO POLE.—Captain Roald Amundsen, the polar explorer who is soon to start on another venture into the Arctic Ocean, will use two airplanes in connection with his expedition. One of these, a *JL-6* metal monoplane, is to be used for the final dash to the North Pole, while the other machine, an *Avro 504-K*, is to be employed as an advance scout of the ship for spotting icebergs, free water, etc.—*Aviation*, 10 April, 1922.

AIR SERVICE PLANS FLYING AIRCRAFT CARRIERS.—The air service is developing plans for aerial aircraft carriers, it is learned in Washington. Means and methods for launching and taking on board small airplanes, carrying gas, ammunition and bombs for distribution to its fleet of planes, are being studied in connection with the employment of large airships by officers of the army air service.

"What the air service needs to day," said one officer, "are lighter-than-air transports for carrying personnel, equipment, spares, gas, and oil, with facilities for picking up and dropping planes, so that the pilots and observers can be relieved in the air, the planes gassed, and ammunition and bombs supplied, without necessitating a return to a land or ship base. Just as the air craft of the navy are cared for by a mother ship or airplane carrier, so must the army craft be supplied from an aerial mother ship," he continued.

#### Originally Planned with *Roma*

"We were making just such plans for experimenting with the *Roma*, but with the delay of getting her into shape and the installation of six new Liberty engines, we had not yet undertaken experiments when she was destroyed. Now we are without a ship with which to conduct our tests and trials, which are based upon sound reasoning and are still believed practical," he said.

The bombing tests off the Virginia Capes last summer, it was pointed out, revealed the fact that airplanes could keep a sea fleet at bay when met at the coast line, or 200 miles out at sea, but it was explained, the planes had to return to their base for a new gasoline supply and for additional bombs, which required considerable time and consumed a lot of fuel. With an aerial supply cruiser such as has been outlined, there

would be no limit to the distance off the coast to which land planes could operate without returning to land, remaining at sea continually. Even small pursuit planes could be so used, it is said, enabling a defensive air force to meet the combat planes of an enemy fleet well at sea, while their mother airship remained aloof and secure from attack at a given location not too distant from the scene of action.

Another use of the aerial transports would be for quick concentrations of air forces at a particular spot lacking in supplies and fuel. The planes could probably reach the spot independently and the mother airship would soon be on hand with the spares, gas and ammunition enough for a long engagement. Nothing would prevent the ships of the air from taking the war into the enemy country with such a portable supply base, it was explained.

#### Secretary Weeks's Views

The possible use of airships for this purpose was mentioned for the first time by Secretary Weeks in commenting on the replacement of the *Roma*. He only mentioned, however, the value of taking airplanes to a distant zone of action, without passing over territory of another power en route.

An aerial aircraft carrier, might also be of considerable value in times of peace, it was pointed out, when it became necessary for example to send a number of short distance aircraft to the Canal Zone. A ship like the *Roma* could have carried several planes suspended from her rigid keel, sailed either down the coast or by a sea route to the Canal, thus avoiding a flight over the confines of another country where national or international aerial laws might prohibit the flight of foreign military aircraft. Airplanes with short cruising radius could not accomplish such a trip without breaking any such existing laws.

Although no experiments had yet been conducted in connection with the development of large lighter-than-air carriers, the plans of the army air service contemplated experiments with the *Roma* in dropping and picking up small pursuit planes while in flight. Just as soon as the *Roma* had made a long trip or two it was planned to take up a small plane suspended by a cable carrying a large hook which was to have been passed through a large and strong ring fixed in the upper wing of the plane before leaving the ground. By means of a reel the plane was to have been hauled up against the rigid keel of the airship and held steady by small auxiliary braces, so that it would point directly ahead, parallel to the course followed and not whip about when the mother craft was under way.

The release of the plane when the carrier was under way was believed a simple problem. The pilot would get into his cockpit from the keel of the airship, start his engine and take the controls of his craft, then the plane would have been lowered slowly by a winch or reel, the pilot keeping the nose of his plane in the wind stream as he sped up his engines. When a safe distance below the big airship, the pull of his propeller keeping his suspension cable nearly vertical, he would signal to the handlers to let go. The catch on the hook would have been released, permitting him to fly off the hook, as it were, which would have been pointing ahead. Officers say that there might have been a slight drop as the plane took off, but if the pilot speeded up his engine gradually in excess of the airship's speed, his momentum and air speed would undoubtedly have taken him off the hook without any difficulty.

#### Picking Up a Plane in the Air

Picking up a plane in the air would have been a little more difficult it was expected, but if the airship lowered her hook pointing it aft, it was believed that with care a pilot could have flown his plane directly

onto the hook. He would have had to fly steadily at a trifle over the airship's speed, directly parallel to her course and exactly beneath her center, so that he could engage the large ring on his upper plane with the open hook on the trailing cable. Once caught on the hook which would have been closed immediately, he would have slowed his engine down as the cable was hauled up, and finally his plane would have been secured and braced against the keel of the mother ship, whereupon the pilot would have stopped his engine and climbed aboard.

With airplanes carried below big airships in this fashion it would be an easy matter to refuel them, supply bombs and machine gun ammunition and change pilots, enabling a weary air man to secure some rest without keeping the plane out of action, air service officers say.

Much remains to be carried out before the plan can be tried officially, but army officers are most enthusiastic about its possibilities although today the army is without an airship capable of carrying out the experiments, officers believe that a replacement ship will be secured for this purpose.—*Aviation*, 3 April, 1922.

NOTICE TO AVIATORS ISSUED BY HYDROGRAPHIC OFFICE, U. S. NAVY.—*Aircraft distress signals*.—Mariners and others are notified that when any aircraft is in distress and requires assistance, the following shall be the signals displayed by her, either together or separately:

I. The International Signal "S O S" by means of visual or wireless telegraphy.

II. The International Code Signal of Distress indicated by N C.

III. The Distant Signal, consisting of a square flag having above or below it a ball or anything resembling a ball.

IV. A continuous sounding with any sound apparatus.

V. A signal consisting of a succession of *white* Very's lights fired at short intervals.

VI. A *white* flare from which at intervals of about 3 seconds a *white* light is ejected into the air.

*Note*.—The above signals are subject to such modification as shall be published from time to time.—*N. A.*, 2 February, 1922.

## ENGINEERING

THE GAS TURBINE.—Outside of German engine builders apparently no engineering manufacturer has recognized the possibilities of the oil-gas turbine. While the cost of development work is high, still the organization that places a commercial gas turbine upon the market should find the returns ample to justify the outlay.

The oil-gas unit has shown an over-all thermal efficiency of 28 per cent. This represents a marked increase over the best steam-plant results. In addition, the labor charge should be largely reduced by the elimination of the boiler room. True, the gas turbine has been built only in comparatively small experimental units, but the experimental work has gone far toward eliminating the blade trouble that existed in the first machines.

At the present time a ten-thousand-kilowatt unit arranged to burn oil is being built in Germany. This machine is a decided advance over the first units, and there is every reason to expect that it will prove reliable. The blade temperatures, which have been the stumbling block, are kept within reasonable bounds by making the process of combustion intermittent instead of continuous. This reduces by about one-half the blade and wheel temperature. If this ten-thousand kilowatt machine proves successful, engineers may confidently look forward to the time when at least some of the larger stations as well as small plants will be equipped with gas turbines.—*Power*, 18 April, 1922.

**DISTILLATION OF MIXTURES OF COAL AND OIL.**—In the course of some experiments conducted by the United States bureau of mines in conjunction with the Trent Process Corporation, it was observed that mixtures of pulverised coal and heavy oils yielded a denser coke than the coal alone, and that even anthracite could be coked in this way. The bureau therefore resolved to investigate whether intimate mixtures of coal and oil would, on low-temperature carbonization, give more valuable products than could be obtained from the separate constituents. The problem—which is not altogether new—was also approached in the hope of producing a coke for domestic use in one operation from low-grade coal mixed with oil.

The report on this investigation, by J. D. Davis and C. E. Coleman, of the Pittsburgh Experiment Station, speaks of the intimate mixtures used as “amalgams”—not a term to be recommended. The amalgams were prepared by churning 12 kg. of non-coking coal, powdered to 200 mesh, with 12 litres of water and 5 kg. of a highly viscous, asphaltic Californian oil; the mixture, agglomerated to lumps of pea size, was drained and air-dried. The retort used for the carbonization at 600 deg. C., was a very heavy 6-in. iron pipe, wound with nichrome wire; the retort was charged with about 5 kg. of the material. In parallel tests ordinary mixtures and the separate materials were distilled. An interesting part of the apparatus was an electric high-tension precipitator for the tar mists; this precipitator consisted of a vertical glass tube,  $1\frac{1}{4}$  in. or 2 in. in diameter, over 3 ft. high, wound outside with aluminium ribbon; the internal electrode, charged to 20,000 volts, was an axial copper wire. This small tube only operated satisfactorily as long as the rate of the gas flow through the tube did not exceed 0.1 cu. ft. per minute. The condensed vapours were distinguished as light oils or gasoline stock, boiling below 221 deg. C.; heavy oils or kerosene stock boiling between 221 deg. and 300 deg. C., and gases.

Considering our scanty knowledge of the real nature of coal carbonization it would have been inadvisable to predict the probable effect of distilling the intimate mixture upon the quantity and quality of the products. It was found that the mixture yielded more than twice as much gas, but only half as much tar as the constituents distilled separately. The amalgam gas was, however, by 43 B. Th. U., or 5 per cent, richer per cubic foot than the combined gases from the coal and oil, and thus the total heating value of the amalgam gas considerably exceeded that of the sum of the gases from the coal and oil. The additional gas came mainly from the oil. The coke amount obtained was increased by 18 per cent by mixing the constituents before distillation, and the coke, though not very firm, was denser than the coke from the coal alone. The yields of oils, gasoline stock and also kerosene stock, were decidedly lower. Light oils strongly predominated in the distillate; the original oil was probably absorbed by the coal and held in contact with it at temperatures far above its normal boiling point. The proportion of light oil might be raised by distilling at reduced pressure. The chief result of the combined distillation was an increase in the amount of gas obtainable. That will be an advantage under certain conditions. To draw an economic balance large-scale experiments would be required.—*Engineering*, 14 April, 1922.

**WORK AHEAD FOR NAVAL ENGINEERS.**—Instead of being the death knell of progress in the navy, the new treaty means, in the opinion of Admiral Robison, engineer-in-chief, that naval engineering will set new goals to achieve. It is the engineer who will take the most important part, he says, in improving the existing plant of the navy until it is comparable with new construction. Ships already old must be rejuvenated to the extent necessary to make them last as long as a new ship and make them capable of standing in the battle line as fit sisters with the few new ships that

may be constructed under the treaty. This is in no way inconsistent with the spirit of the agreement which provides for limitation rather than disarmament, and it is important that the units remaining be maintained in the most efficient state.

Improvements that would have been unwise under the old order will be made on vessels that would have been approaching retirement age. By the application of clever engineering Admiral Robison expects to see such ships brought to a high state of efficiency. This is especially true of their power plants. The reduced appropriations will mean, necessarily, that the navy's engineers be given every encouragement to exercise the fundamental function of all engineers—that of eliminating waste. Waste heat can be trapped, Diesel engines can be installed to furnish auxiliary electric power, lubricating oil can be purified before re-use, thereby cutting down the cost of bearing renewals, and greater use can be made of exhaust steam.

This is only a portion of Admiral Robinson's conception of the part the engineer is to play in the new navy. Force of circumstances will spur engineering endeavor to a point never before attained in that branch of the service, he believes.—*Power*, 11 April, 1922.

**THE SPROULE INTERNAL-COMBUSTION ENGINE.**—A new type of internal-combustion engine, the Sproule, has appeared in England. The principal drawbacks in present-day internal-combustion engines are limited flexibility and absence of overload capacity, low efficiency at light loads, and difficulty of reversing. That is, the internal-combustion engine can give the best results only at full speed.

In the design of this engine a pair of pistons work in a common combustion space, each piston operating a separate crankshaft. The two shafts are geared together at a 2 to 1 ratio, so that one piston makes two complete strokes while the other makes four. The method of gearing the two cranks is such that the relative angular setting of the two crankshafts in respect to each other can be varied at will, whether the engine is in motion or not.

When the two cranks are set so that at a given time in the cycle the two pistons are together at the back end of their strokes, the minimum compression space is available. In this case a small charge of gas will be compressed normally, but will be expanded to more than its original volume, giving an increased efficiency. If, now, the two-stroke crank is advanced relatively to the four-stroke crank, the two pistons cannot coincide at the back position, so that the minimum compression space becomes the fixed space plus a small portion of the two-stroke cylinder volume, the total giving the larger space necessary for a heavy load. The expansion ratio will now be less, but up to the normal full load it is still greater than the compression ratio and gives a high expansion efficiency at loads up to full load. The two-stroke crank can be advanced to give about 40 per cent more than the normal full-load charge, the expansion ratio being then a little lower than the compression ratio, so that a large overload capacity is provided with only a slight drop in efficiency.

It is claimed that this engine, while retaining all the advantages of the ordinary internal-combustion engine, is as flexible as the steam engine.—*Power*, 11 April, 1922.

**A FIFTY-KNOT TORPEDO.**—An ingenious application of the gyroscopic method for steering torpedoes invented about 1884 by Captain John A. Howell, an American naval officer, has recently been introduced in a high-powered turbine-driven airplane torpedo designed by Mr. H. W. Shonnard of Montclair, N. J., who for several years was associated with the development of the well-known Bliss-Leavitt torpedo, now the standard weapon of its kind of the American navy.



Until Howell proposed the utilization of the gyroscopic force created by a spinning mass, and adapted such to practice by constructing a small torpedo fitted with a heavy fly-wheel having its axis in the horizontal plane athwartship, which fly-wheel when spun to a high rate of speed served the double purpose of furnishing gyroscopic force and also energy for propulsion, no reliable self-controlling means of steering torpedoes had been developed.

Under the plan devised by Howell, a lateral extraneous force that might tend to deflect the torpedo from its course, would cause the torpedo, through the gyroscopic action of the rotating fly-wheel, to roll slightly to port or starboard, according to the direction of said force, and bring into action a pendulum-controlled ratchet mechanism which operated a pair of vertical rudders. This means of steering was very effective and reliable. About 1888 the Whitehead Torpedo Works succeeded in applying a gyroscopic principle for steering in the form of a miniature removable unit, known, after its inventor, as the Obry steering gear. This device gave such control.

Throughout the subsequent evolution of the torpedo the excellent principle evolved by Howell has for many years apparently escaped the attention of inventors and engineers.

In the Howell method the elemental basis of control originates in the gyroscopic force of the torpedo's motive means, which, it will be remembered was a heavy fly-wheel in which necessity for delicate adjustment is eliminated, since any tendency of the torpedo to leave its course as a result of extraneous influence is automatically suppressed. On the other hand, in mechanism of the Obry type no automatic suppression or correction of gyroscopic precession is possible, the course of the torpedo being entirely dependent upon a miniature, delicately-mounted gyro-wheel remaining in the plane of rotation established at the time of launching the torpedo. Should it precess, and it usually does, and often to a considerable extent, proportionate deflection in the torpedo's course results.

Continual advancement in the speed and range of torpedoes and the height from which it becomes desirable to launch them, now that the airplane is available for the purpose, calls for gyroscopic mechanism of a rugged nature that is capable of continuous and closer control than is characteristic of Obry gear. The solution of these requirements is to be found in the method of Howell, and the designer has accordingly applied the same to his turbine-driven torpedo in the manner illustrated.

In Fig. 1 is shown the general arrangement of the Shonnard 50-knot airplane torpedo, wherein turbine rotors create the gyroscopic force necessary for steering under the Howell system. By referring to Fig. 2 which is a view of the turbine compartment looking aft, it will be noted that the two turbine rotors 1, 1, of the DeLaval type, which are geared to revolve at 22,000 revolutions per minute in like direction as is indicated by arrows, are mounted upon horizontal axes, one each side of the major, or longitudinal, axis of the torpedo, and a servo-motor, or air engine 2, controlled by a pendulum 3, is located below the turbine. This pendulum unit which is connected with the vertical rudders 4, 4, by the rod 5, Fig. 1, operates said rudders in response to the gyroscopic action of the turbine rotors, exactly as the pendulum arrangement of Howell operated rudders in response to the gyroscopic action of a fly-wheel.

The motive energy used to operate the turbines is superheated steam in combination with the products of combustion of alcohol burned in compressed air; which mixture enters the turbine nozzles at a pressure of 500 pounds per square inch and at a temperature of 1,500 degrees Fahrenheit.

In combining the steering and motive elements in a single unit, a further advantage is secured in the saving of weight due to the elimination of the Obry gear mechanism which effects sufficient change in moment to permit of the installation of a power plant capable of developing 500 horsepower without disturbing the normal horizontal trim of the torpedo. In view of the probable limitation of warship construction, Mr. Shonard's proposal becomes of particular interest, since it presages a notable advance in airplane torpedoing for coast defense.—*Scientific American*, May, 1922.

**INTERNAL DIAGONAL ARMOR FOR WARSHIPS.**—The diagram accompanying this article which shows the cross-section of a battleship, represents, by the two heavy black lines, a suggestion by one of our shipyard workers, Mr. C. H. Scheelky, for a method of armoring warships to meet attack by modern high-angle fire, by aerial bombs and by torpedoes.

In spite of its striking novelty and certain difficulties of interference with boiler and engine-room accommodations, the general idea is so much in keeping with the latest theories of warship armoring that we present it for consideration. The armor plan of ships built prior to the war calls for very heavy vertical armor, supplemented by light deck or horizontal armor. That was in the days when 10,000 yards was considered an extreme fighting range, and when shells fell upon a ship at an angle of 6 to 8 degrees. Today, the fighting will be at the extreme practical range, and the angle of fall will be from 18 to 25 degrees; which means that the greater part of the deck will be opened to direct attack. Hence the growth in favor of internal inclined armor.

The interesting point about the proposed method is that the design shows no vertical armor, and that the inclined armor is carried right down to the bilges. In answer to our question as to why this was done, Mr. Scheelky answers that torpedo attack has become so effective and deadly that it is necessary to keep the blast of explosion out of the engine and boiler rooms if the ship is not to be disabled.—*Scientific American*, May, 1922.

**KITCHEN RUDDER FOR FERRIS WOODEN SHIP.**—Plans have now been completed by The McNab Company of Bridgeport for the installation of the Kitchen reversing rudder on one of the Ferris type wooden ships which certain California shipping interests propose to convert into a Diesel engined vessel. A 1,400-h.p. Diesel engine of American make is being thought of. With the Kitchen reversing rudder fitted the engine would not have to be reversible. The operating gear could be of either the electric or hydraulic type. With this rudder it is claimed the vessel would have a maneuvering ability equal to that of the best Diesel electric driven ship. In addition the propelling machinery would be simplified to quite some extent and all transmission losses eliminated.—*Nautical Gazette*, 22 April, 1922.

**ALLOY CASTINGS TO RESIST HIGH TEMPERATURE.**—For the manufacture of retorts and other parts subjected to temperatures as high as 2,200 deg. Fah., the American General Electric Company has developed a new metal alloy known as "calite," which can be cast in the same way as iron and steel. The castings are adaptable for furnace parts, recuperators, heat exchangers, etc. Containers made of calite are used for carbonizing, case-hardening, annealing, and heat treating. Retorts, pots, boxes and other containers are used for melting Babbitt metal, copper, lead, and tin; for holding chemicals giving off corrosive fumes, and for other purposes in high-temperature work. The melting point of this metal alloy is 2,777 deg. Fah.; its softening temperature, 2,500 deg.; and its safe and maximum



working temperatures, 2,200 deg. and 2,370 deg. respectively. The specific heat 100 deg. to 15 deg. Cent is .123; thermal conductivity, 25 per cent that of iron; shrinkage from molten to cold condition,  $\frac{1}{4}$  in. per foot. It has a specific gravity of 7.03, and weighs 0.25 lb. per cubic inch. In physical properties, calite has an elastic limit of 36,800 lb., a reduction of area (cast) of 2 to 3 per cent, and an elongation of 1 per cent. When annealed, it has a hardness of 286 by the Brinell method and 40 by the scleroscope. A bar 1 in. square supported on bearings 12 in. apart has a transverse test strength of 4,250 lb.—*The Engineer*, 14 April, 1922.

**DEVICE AUTOMATICALLY SHUTS OFF FUEL OIL FROM BURNERS.**—The increasing use of oil as fuel has led to the invention of many safety devices, one of the latest of these being the Todd Guardian which automatically shuts off the oil supply to the burners, when through any unforeseen condition the water has become dangerously low in the boiler.

The action of this device depends upon the water level in the boiler, which causes a bucket to fall. This movement sets a cradle in motion, permitting steam to escape to an oil-supply stop valve.

The device consists of a cast-iron body having two chambers. In one is a bucket float with anchor and chain suspensions to prevent the bucket from touching the sides of the chamber. The float is connected to a spindle. The steam connection is at the top and the water at the bottom. The bucket is always full of water, and it balances when four-fifths of its height is immersed in water.

When the water level falls in the boiler, it also drops in the float chamber, and the weight of water in the bucket will, at the danger level, produce by its weight a strong downward pull on the spindle and cause the cradle to tip, whereupon a ball falls out and strikes the ram head on top of a cartridge. The ram has a peculiar shaped point which perforates a copper disc and allows steam to escape through the opening thus made. This steam enters a stop valve above the diaphragm, which automatically shuts off oil fuel supply to burners.

As the cartridge is a complete unit, it is easily inserted, but not until the ball has been pushed back into the cradle by means of a rod.—*Nautical Gazette*, 29 April, 1922.

**DIET-MORE VALVE DRAINS CYLINDERS AUTOMATICALLY.**—A relief valve for use with all kinds of reciprocating steam equipment, which automatically drains the cylinder when the throttle is closed, is shown in Fig. 1. The object of the device is to make it unnecessary for the engineer to bother with opening and closing the cylinder drain valves and to make for greater safety.

The drain pipes from the two ends of the cylinder are brought down just below the cylinder and connected to the valve body at both sides, as shown in Fig. 1. There being no valves in these pipes, the full steam pressure carried in the engine cylinder is let into the valve chamber, tending to lift the valve disc. However, the disc will not be raised by this pressure if the engine throttle is open, because the full steam pressure at the throttle is holding it down. This full steam pressure is let in through the top opening, to which a pipe from the steam chest is connected. The pressure in the steam chest is, of course, a little greater than that in the engine cylinder, and so the valve stays closed while the engine is running.

When the throttle is closed and the engine is stopped, however, the valve disc no longer has more than atmospheric pressure above it, and so is raised by the spring beneath it. This leaves a free passageway from the two ends of the cylinder into the drain pipe, so that water runs out of the cylinder as fast as it condenses. When the throttle is opened later to

start the engine again, the cylinder is already free of condensation, and the drain valve is closed by the steam pressure in the valve chest.

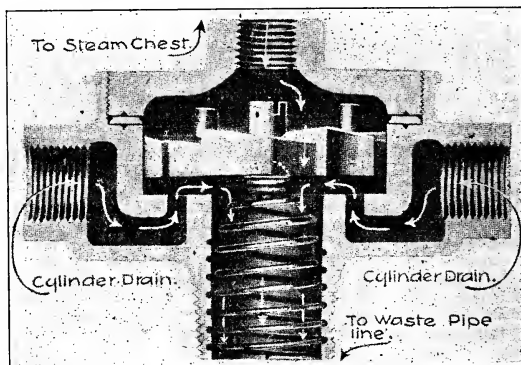


FIG. 1. AN AUTOMATIC CYLINDER DRAIN AND RELIEF VALVE

With the engine running, full throttle pressure holds the disc down against the cylinder pressure under it; with the throttle closed and the engine idle, the spring raises the valve disc, draining the cylinder. Any water that enters the cylinder while the engine is running forces the valve open and escapes.

The top of the valve disc is so shaped as to give a sort of turbine action, the pressure of the steam tending to turn it. Since it is connected with its spring by a joint that leaves it free to turn, it is given a slight twist every time it is closed, and so may be said to be self-grinding. On the circumference of the disk are eight shallow grooves, as shown in Fig. 1, so that condensation from the steam chest can escape into the main drain, together with that from the cylinder itself.



FIG. 2. WHISTLE DRAIN

The spring that holds the valve disk off its seat may be easily adjusted for tension by screwing it in or out, a helical groove being cut on the inside of the pipe to correspond with the turns of the spring. The device may act not only as a drain valve, but also as a relief valve, in this way: If water comes into the cylinder while the engine is running, the piston will force it through the drain pipe into the relief valve and up against the bottom of the valve disk; as the pressure under the disk will then be temporarily greater than over it, the disk will rise and let the water out. Of course, a large slug of water would scarcely pass through the small drain pipe fast enough to avoid wrecking the valve in this way, and so partly, at least, protect the engine.

Another use of the device is with direct-connected engines, as locomotives. In such cases, when the engine is idling the valve disk is kept

off its seat by the spring, there being no pressure over it, and hot air is drawn back and forth between the two ends of the cylinder. This avoids warping of the cylinder, which is otherwise likely to be caused by the cold drafts of air that are drawn in at every stroke through the usual type of drain cock.

By the addition of two extra drain inlets in the valve body, making four in all, the valve is made suitable for use on duplex pumps.

The smaller valve in Fig. 2 works on much the same principle, and is applied to whistles and similar devices that may give trouble with condensation. The spring holds the valve open until steam is turned on, when the pressure closes it.—*Power*, 4 April, 1922.

## NAVIGATION AND RADIO

CONSOLIDATED SHIPBUILDING CORPORATION TURNS OUT LARGEST LIGHT VESSEL IN THE WORLD FOR DIAMOND SHOAL STATION.—The Consolidated Shipbuilding Corporation of Morris Heights, New York City, has just completed and delivered to the light house department, Washington, two 160-foot light house tenders named the *Oak* and *Hawthorne*, and one 147-foot lightship named the *Diamond*. These vessels have been under construction at the Consolidated yards for the past year and have been built to specifications of the United States government.

The tenders are constructed of steel with a continuous main deck, a raised forecastle deck, a main deckhouse and partial upper deck, and upper deckhouse aft. The steam generating plant consists of one Scotch type boiler using bituminous coal for fuel. The main propelling engine consists of one vertical triple expansion engine, surface condensing, driving a single screw, and developing 700 indicated horsepower.

The new lightship *Diamond* is the largest light vessel in the world and will be stationed off Cape Hatteras on the dangerous outer Diamond Shoal, one of the most treacherous and exposed points on the Atlantic coast. The vessel is to replace the former light vessel No. 72 which was sunk by a German submarine in August, 1918, while occupying this station.

She is 147 feet long overall, has a beam of 30 feet, and a displacement of 825 tons. She is of the self-propelled type, single screw, driven by a fore and aft compound engine with cylinder diameters 16" and 31" and a common stroke of 24". Steam will be supplied by two Scotch boilers using oil as fuel.

### Description of Lights

The vessel will show a flashing light from a 375 m.m. lens lantern at the foremast head, the illuminant being acetylene gas, controlled by an electric flasher operating the gas burners, and giving the light a characteristic distinguishing it from other lights on the neighboring coast. This apparatus will be in duplicate, with a lantern on each of the two mastheads, so that in case of accident the other light may be used.

This vessel will be equipped with three distinct fog signals, a steam chime whistle, a submarine bell, and an automatic radio fog signal, thus using three different mediums for sending warnings to the mariner of danger in fog. The *Diamond* will be the first lightship of the lighthouse service to be equipped on construction with the radio fog signal.

The crew are provided with comfortable quarters and modern conveniences, including a refrigerating plant.—*Nautical Gazette*, 22 April, 1922.

MODERN DEEP SEA SOUNDER.—Among the crew of the new White Star-Dominion liner *Regina* is P. S. Hudson, who has invented a modern deep sea sounder, meant to supersede the ancient lead and to give authentic samples of ocean bottoms. Mr. Hudson states that his invention has

been adopted by the British admiralty and accepted by the board of trade.

The Hudson sounder is approximately four feet long, and weighs about thirty-four pounds. It has been designed to meet the demands of immediate service, and to withstand the severest conditions of usage. The sinking weight is usually of cast iron, slung on a stout steel bar, and welded to ensure perfect rigidity. The cap is entirely of gun metal, and contains a small filter bag, to which the matter entering the cup is carried, and the salt water passing through the filter allows the solid constituents to remain in the filter bag.

The filter is made accessible by means of a screwed gun metal nose piece, perforated to permit the expulsion of salt water. This arrangement provides that the sample passages shall be comparatively pure, and as far as practicable free from salt water, and so collects the solid matter, thus giving excellent results.—*Nautical Gazette*, 15 April, 1922.

TO DREDGE BERMUDA CHANNEL.—Lloyd B. Sanderson of Sanderson and Son, New York agents of the R. M. S. P., announces that the Bermuda development board will soon begin dredging and blasting operations in Dundonald Channel, the sea entrance to Great Sound, twelve miles from Hamilton and on two rocky passages near Hamilton. The work will be completed by fall. Twenty-five to twenty-six feet at low water will be provided in the channels, so that big liners can dock at Hamilton instead of anchoring in Grassy Bay and landing their passengers by tender.—*Nautical Gazette*, 22 April, 1922.

ONE-WAY ROUTES FOR PACIFIC.—In order to reduce the risk of collision at sea the hydrographic office of the navy department has taken definite steps towards double tracking the North Pacific Ocean. Co-operation of the Japanese, Canadian and British naval and steamship authorities has been sought, and data is accumulating on which a decision finally will be made, possibly in the near future. The project contemplates mapping out the most favorable courses from North Pacific ports on this side to Japan and return, westbound and eastbound traffic following prescribed routes well separated from each other.—*Nautical Gazette*, 15 April, 1922.

MEASUREMENT OF OCEAN DEPTHS.—A new device just developed by the navy department and which makes possible the accurate measurement of any depth of the ocean possibly will result, hydrographers say, in the charting of spots in the sea which have never been measured because their depth was too great for the old method of sea sounding work.

The new device is said to employ sound apparatus similar to that used during the war for the detection of submarines. The principle of its use is that of creating a sound on the ship and listening for the echo of this sound from the bottom of the ocean, measuring the time between the creation of the sound and the return of the echo.—*Nautical Gazette*, 22 April, 1922.

RADIO COMPASS USE.—The radio compass is rapidly coming into use on the Great Lake fleets. The United States navy has sold from its surplus stock many complete installations and with the aid of the three navy radio compass stations located at the so-called "graveyards" of the lake at Whitefish Point, Detour Point, and Grand Marais cross bearing may be obtained at any time. The radio compass has proved of special value in case of fog and snow in determining the relative position of the ships and ship owners are enabled to keep in direct communication with the vessels through the navy radio relay service.—*Tech. Engineering News*, May, 1922.

**RADIO BEACONS CAN BE MADE TO OPERATE AUTOMATICALLY.**—Radio beacons, which are radio transmitting stations intended primarily for direction finding work, can be installed at small expense on lighthouses and light vessels. The transmitting equipment may be designed to operate automatically by simply throwing a switch, so that no additional personnel is necessary. The radio transmitting equipment is set into operation by the lightkeeper, just as the other signaling devices at the light station. The expense of operating the radio beacon is therefore small.

The department of commerce has established three radio beacons at the approaches to New York harbor, on Ambrose Lightvessel, Fire Island Lightvessel and at Sea Girt Lighthouse, Sea Girt, N. J. These three beacons are now in regular commission and transmit waves of a frequency of 300 kilocycles per second (wave length=1,000 meters). A radio beacon is being installed on San Francisco Lightvessel No. 70. These beacons have automatic transmitting equipment so that no operator is necessary.—*Nautical Gazette*, 22 April, 1922.

**RADIO ON MAIL PLANES.**—One of the big air mail ships came over from Chicago to Washington April 15 in the flying time of 6 hours and 2 minutes, piloted by E. Hamilton Lee. The mileage was 715 miles, which averaged 119 miles per hour. This ship came here for the purpose of having installed as a part of its equipment the radio sending and receiving telephones. This is the first of the transcontinental ships to be equipped with this wireless telephone outfit. It is expected to equip all of the air mail ships with these instruments. The radius is 200 miles. With this wireless telephone equipment attached to the airships the pilot will be in constant touch with the station just left and the one to which he is flying. There will also be a range finder to locate the station toward which he is flying during foggy and stormy weather.—*Aerial Age Weekly*, 24 April, 1922.

## ORDNANCE

**MANUFACTURE AND PROPERTIES OF STEEL PLATES CONTAINING ZIRCONIUM AND OTHER ELEMENTS.** [ABSTRACT.]—This investigation originated from the need of the ordnance departments of the army and navy for information regarding the effects on the ballistic properties of light armor plate of certain chemical elements such as zirconium.

A joint program was outlined according to which the bureau of mines was to produce and analyze ingots of the desired compositions; the bureau of standards to manufacture and heat-treat plates, carry out physical tests, micro-examinations and chemical analyses, and develop methods of chemical analysis, when needed, for the more unusual elements in steel and in the presence of each other; and the navy department was to carry out the ballistic tests.

Although the results of the ballistic tests are not available for publication, an account of the mechanical properties and tests of this series of somewhat unusual steels was considered worthy of publication. These results may be summarized as follows:

About 193 heats of steel containing in various combinations the following principal variable elements: carbon, silicon, nickel, aluminum, titanium, zirconium, cerium, boron, copper, cobalt, uranium, molybdenum, chromium, and tungsten, have been studied.

None of the steels presented any difficulties in rolling into plate except those containing boron.

The usual mechanical properties and impart tests were carried out on all of the steels. It is shown that steel containing 0.40 to 0.50 per cent carbon, 1.00 to 1.50 per cent silicon, 3.00 to 3.25 per cent nickel, and 0.60

to 0.80 manganese and deoxidized with a simple deoxidizer such as aluminum can be produced having a tensile strength of approximately 300,000 pounds to the square inch, with excellent ductility and toughness. This type of steel is recommended for a structural material.

Although the same high properties are obtained in steels of the above composition with the aid of additional elements it does not appear necessary to resort to such additions of expensive alloying elements.

Zirconium, like titanium and aluminum, acts primarily as a scavenger, and when it is not removed as part of the slag remains in the steel in the forms of square bright yellow inclusions not directly visible at magnifications lower than 500 x. It is not considered that these inclusions can be very beneficial, and if they are segregated and rolled out into thin plate-like streaks they may be detrimental, especially in armor plate.—*U. S. Standard Bureau of Notes*, April, 1922.

**SHRINKAGE OF 4.7-INCH GUN MODEL 1920 MI.**—The assembly of 4.7-inch gun Model 1920 MI. presented a difficult problem to accomplish the assembly of the jacket. The difficulty is due to the fact that the jacket is of unusual length in proportion to the diameter of its bore; the thickness of wall is also relatively thin which fact makes the radiating surface unusually great as compared to the weight of metal. Added to the unusual proportions of the jacket the fact that the jacket has to be shrunk over a wire-wound surface for almost its entire length introduces another difficulty; it being more difficult to refrigerate the gun proper and contract the outer diameter of the wire-wound surface.

The difficulty in refrigerating is due to the fact that the lack of continuity of the metal between the tube and the different layers of wire forms zones which retard and make less effective the passage of the cooling water through the bore of the gun with the result that the heated jacket causes the wire-wound surface to expand and come in contact with the jacket before the jacket is assembled to its proper position.

The total length of the finished jacket is about 163 inches; the diameter of the bore at the muzzle end being 7.2 inches. The bore of the jacket is composed of four (4) cylindrical zones—the longest being 102 inches in length. The total length of the gun tube is 225 inches. This tube is wrapped with a series of layers of wire 1/10-inch square extending from a point 2½ inches forward of the breech end for a distance of approximately 142 inches.

A shoulder formed by a collar threaded on the breech end of the tube 1.5 inch. from the end provides a seat for a corresponding shoulder at the breech end of the jacket. The assembly of the jacket against the shoulder formed by this collar locks the tube to the jacket and assists in preventing a longitudinal movement of the tube forward in the jacket.

It is very important that it be made certain that the shoulder is in contact as any longitudinal movements of the tube would result in gas leakage due to faulty obturation. After the tube had been wire-wound the surface was turned smooth to the diameter of the bore of the jacket plus the prescribed shrinkage; care being taken to make the bore of the jacket of such size that the proper diameter of the wire-wound surface would result with the removal of very little metal from the last layer of wire.

A plug carrying two (2) water connections—one an inlet and the other an overflow or outlet was assembled into the breech end of the tube. Before the tube was assembled into the heated jacket it was lowered into the shrink pit muzzle end up and water connection made to the inlet plug at the bottom. The overflow pipe which is assembled in the interior of the tube extends from the plug upward to a point slightly above the surface corresponding to the muzzle end of the jacket when assembled. Water

was then turned on until it just discharged through the overflow pipe. This arrangement was necessary to permit a continuous flow of cold water in the interior of the tube and to delay the absorption of heat by the tube from the jacket so as to maintain as much difference in temperature between the tube and the jacket as possible as it was expected that the tube with the wire-wound surface would rapidly extract heat from the jacket and cause the jacket to grip the tube before assembled to proper position.

As previously stated it is absolutely essential to maintain shoulder contact at the breech end of the jacket and tube. To accomplish this it is necessary that the jacket be made to grip the tube first at the breech end so that when longitudinal contraction takes place in cooling, the slippage of the jacket due to contraction should all be from the muzzle and towards the breech end of the jacket which should be held stationary.

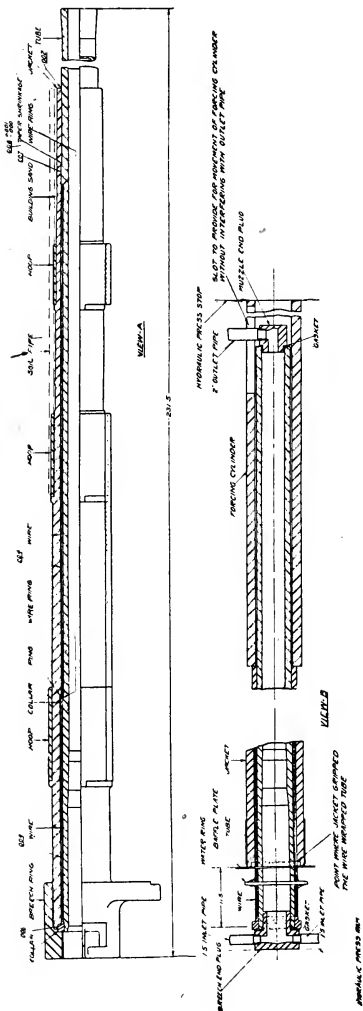
To eliminate the tendency of the jacket to come in contact with the tube first at the muzzle end where the thickness of wall is a minimum, a heat retainer was assembled over the muzzle end of the jacket. This heat retainer consisted of an ordinary soil pipe which was slid over the muzzle end of the jacket against a shoulder about 76 inches from the muzzle end. The space between the heat retainer and the jacket was filled with coarse building sand after which the jacket with its heat retainer was lowered into the electric furnace, muzzle end up, and heated slowly through a period of about seven (7) hours to a temperature of 750° F., this temperature being held for a period of ten (10) hours.

The jacket was then removed from the furnace and lowered over the muzzle end of the tube; water being circulated through the tube constantly as previously stated. The jacket on being lowered over the tube gripped the tube at a point about 11.6 inch from its contact shoulder, gripping it sufficiently to support its own weight thus preventing further assembly.

It was now decided that it would be necessary to apply pressure to the jacket if it was to be successfully assembled. There was some question, however, as to whether or not this could be successfully accomplished, due to the fact that it would be necessary to get a difference in temperature between the wire-wound surface and the jacket sufficient to move it at a pressure not exceeding the elastic limit of the metal. It would also be necessary to slide the jacket along the wire-wound surface at the muzzle end for 11.5 inches. This wire surface being exposed it would be necessary to cool it quickly without extracting any heat from the end of the jacket. The plug was made to fit into the breech end of the tube having a shoulder to bear against the breech face of the tube. The outer end of the plug would come in contact with the ram of the hydraulic press. Into the projecting sides of the plug two (2) holes were drilled connecting with a longitudinal hole also drilled in the plug.

These holes were tapped for two (2) 1.5-inch pipe connections to be used as water inlets. A plug was also fitted into the muzzle end which was tapped for a 2-inch pipe into which was assembled a pipe rising to a height which would permit the bore of the tube to be filled completely with water when in horizontal position. This pipe being used as a water outlet.

A forging was secured with a bore larger than the diameter of the tube at the forward end of the jacket and of sufficient length to extend from the muzzle end of the jacket to a point beyond the muzzle end of the tube to take the back thrust of the press. A slot through the side of this forging permitted the passage of the 2-inch outlet pipe from the plug in the muzzle end of the tube mentioned in the previous paragraph.



JACKET ASSEMBLY, 4.7-INCH GUN, MODEL 1920-M1



A baffle plate of thin sheet metal circular in form the same diameter as the wire-wound surface was assembled at the breech end of the jacket in order to permit the free application of water on the protruding wire surface without having it come in contact with the breech end of the jacket. When these preparations were completed the gun was placed in the electric furnace and heated as previously described to a temperature of 750° F. The gun was then removed from the furnace and placed in the horizontal hydraulic press; the plugs with their water connections were assembled and water connections were made to two (2) 1.5-inch inlets and the ram of the hydraulic press brought up against the plug at the breech end of the tube; a pressure of twenty (20) tons being applied. This pressure was applied to hold the plugs against their shoulders and to prevent the escape of any circulating water.

It is necessary that the lapse of time from the removal of the gun from the furnace to the hydraulic press be as short as possible as there is a large amount of radiating surface and the temperature drops rapidly. Therefore it is necessary to have all arrangement completed to the minutest detail.

The gun was removed from the furnace at 9:35 A. M. It was in position in the press at 9:40 A. M.; the pressure of twenty (20) tons being applied at 9:41 A. M. and water circulated through the tube one-half ( $\frac{1}{2}$ ) minute later. As soon as the water was turned into the tube the pressure on the press was increased to forty (40) tons and at 9:42½ A. M. the tube started to move into the jacket which means that after water circulation had been obtained for one (1) minute the temperature between the jacket and the tube was of sufficient difference to contract the diameter of the tube sufficiently to nearly break contact. The approximate difference in temperature necessary to accomplish this result is 100° F.

In forcing the jacket onto its contact shoulder it was necessary that the pressure used be limited to that value which would not exceed the elastic limit of the metal. It was also necessary to continually measure the position of the jacket in order to quickly reduce the pressure when the jacket reached the contact shoulder as the cross section of the metal at this point made necessary a reduction in pressure in order not to exceed the elastic limit of the metal at this point to which the stress would now be transferred. The jacket was in contact with the shoulder at 9:49¼ A. M. As the shoulder came in contact the circulating water was discontinued and the pressure in the hydraulic press held to one hundred and fifty (150) tons in order to maintain shoulder contact, as the tendency in cooling would be to pull away from the shoulder. At 9:50 A. M. the pressure was reduced from one hundred and fifty (150) tons to one hundred (100) tons. The jacket was observed to move slightly off shoulder. The pressure was again raised to one hundred and fifty (150) tons bringing the shoulders again in contact. This pressure was held until 11:30 A. M. at which time the temperature of the jacket and tube was so nearly uniform as to preclude any tendency to change their relative positions.—*Army Ordnance*, March-April, 1922.

### MISCELLANEOUS

RUSSIAN NOTES.—News of the Russian navy comes through at rare intervals, and even then is not always reliable. It transpires, however, that the Soviet government has lately been exhibiting more than its ordinary interest in naval affairs, and has just issued a peremptory order to the Baltic fleet command, insisting on the maintenance of stricter discipline and a higher standard of efficiency. It remains to be seen whether this order will have any effect. All the evidence points to the navy as being in a state of hopeless disorganization. Training has been almost entirely in abeyance during the last few years, the few capable officers and skilled

technicians who survived the Bolshevik revolution having since left the service, and the remaining personnel are said to be more or less ignorant of the rudiments of their profession. As these reports are largely based on hearsay evidence, they may be misleading, though, in view of the long period which has elapsed since any Russian warship was seen at sea, there can be little doubt that the fleet has greatly deteriorated both in personnel and material.

The dreadnought battleship *Petropavlovsk* and *Sevastopol* have been renamed *Parishskaya Kommuna* (*Paris Commune*) and *Marat* respectively, and some of the smaller vessels are also said to have new names. The *Petropavlovsk*, it will be recalled, was torpedoed in Kronstadt Harbour by a British c. m. b. in 1919, but having sunk in shallow water on an even keel, she was raised without much difficulty. In March last year both this vessel and the *Sevastopol* were reported to have been "blown up" at Kronstadt by revolutionaries of Colonel Koslovski's party, but as, according to all accounts, both are still in service the damage cannot have been very severe. An interesting feature of these ships and the other two of the class is that they are armed with 12-in. guns of 52 calibres, the longest main battery guns at present mounted in any capital ship. The Baltic fleet is credited with a present strength of 60 destroyers, including 22 large boats of 1,260 to 1,610 tons, and about 20 submarines, several of which are minelayers, carrying 42 mines each. This, however, is a paper estimate which is probably far in excess of the effective establishment.—*Naval and Military Record*, 5 April, 1922.

ARGENTINE NOTES.—According to reports published in Berlin, the Argentine government has adopted a submarine programme, and a number of boats have already been laid down at Bahia Blanca under the supervision of German engineers. The building material is to be imported from Germany and apparently the engines as well, though it is not easy to see how this can be done without violating the provisions of the peace treaty. The submarines are to be modelled on a design that was constructing in Germany at the armistice. Their displacement will be 820 tons on the surface and 1,010 tons submerged, the speed 15½ knots above and 8 knots below, and the armament two 4.1-in. guns and six tubes. The Argentine navy has not hitherto possessed any submarines, but both Brazil and Chile have a few in service.—*Naval and Military Record*, 5 April, 1922.

RED FLEET TO BE ON WAR FOOTING.—The Soviet government has issued a decree ordering the fleet to be put on a war footing immediately. The Baltic fleet consists of two dreadnoughts, two cruisers, and torpedo boats, and submarines in comparatively good condition. The Caspian fleet is in poor condition, and the Black Sea fleet has disappeared. Personnel is reported at 48,000, but it is believed to be only 30,000.—*Naval and Military Record*, 19 April, 1922.

GYROSCOPIC STABILIZER TEST SUCCESSFUL.—A very successful test of the gyroscopic stabilizer that has been built for the Shipping Board's passenger steamer *Huron* by the Westinghouse Electric and Manufacturing Company was made last week at the South Philadelphia Works. But for a few incidental adjustments, the stabilizer is practically ready for installation in the ship now. The contract for the stabilizer was secured by the Sperry Gyroscope Company direct from the Shipping Board and it was built from Sperry designs by the Westinghouse Company.—*Nautical Gazette*, 15 April, 1922.

CHANGES IN GEOGRAPHICAL POSITION.—Cambridge has moved twenty-six feet away from Greenwich in the period of forty years according to

Professor J. W. Evans, scientific advisor to the colonial office. This unseemly conduct has not been confined to Cambridge, but Professor Evans states also that Greenwich, supposedly the stable center of time, has moved half a mile toward the equator in a period of eighteen years and also that Naples has moved a mile and a half in the same direction in a period of fifty-one years. Professor Evans also believes he has discovered the causes of the rise and fall of the earth's surface amounting to about eighteen inches, in response to the force of attraction of the sun and moon on the earth. The English scientist believes these phenomena are due to the effect of the sun's heat on the deserts south of Europe—the Sahara for instance. The intense heat generated there causes expansion of the surface and sufficient to lift the entire surface a distance that can be detected by delicate instruments.—*Tech Engineering News*, May, 1922.

#### CURRENT NAVAL AND PROFESSIONAL PAPERS

"Naval Policy and Naval Training"—*North American Review*, May, 1922.

"Merchant Commerce and World Shipping in Relation to Sea Power"—*Engineering*, 7 April, 1922.

"Deep Water Quays"—*Engineering*, 31 March, 1922.

"Longitudinal Strength of Cargo Vessels and Its Variation with Fullness of Form"—*Engineering*, 21 April, 1922.

"Recent Developments in Motor Lifeboats"—*Engineering*, 21 April, 1922.

"Application of Electric Motors"—*Power*, 18 April, 1922.

"Recent Developments in Gas and Oil Turbines"—*Power*, 2 May, 1922.

"Surveying from the Air"—*Journal of the Franklin Institute*, April, 1922.

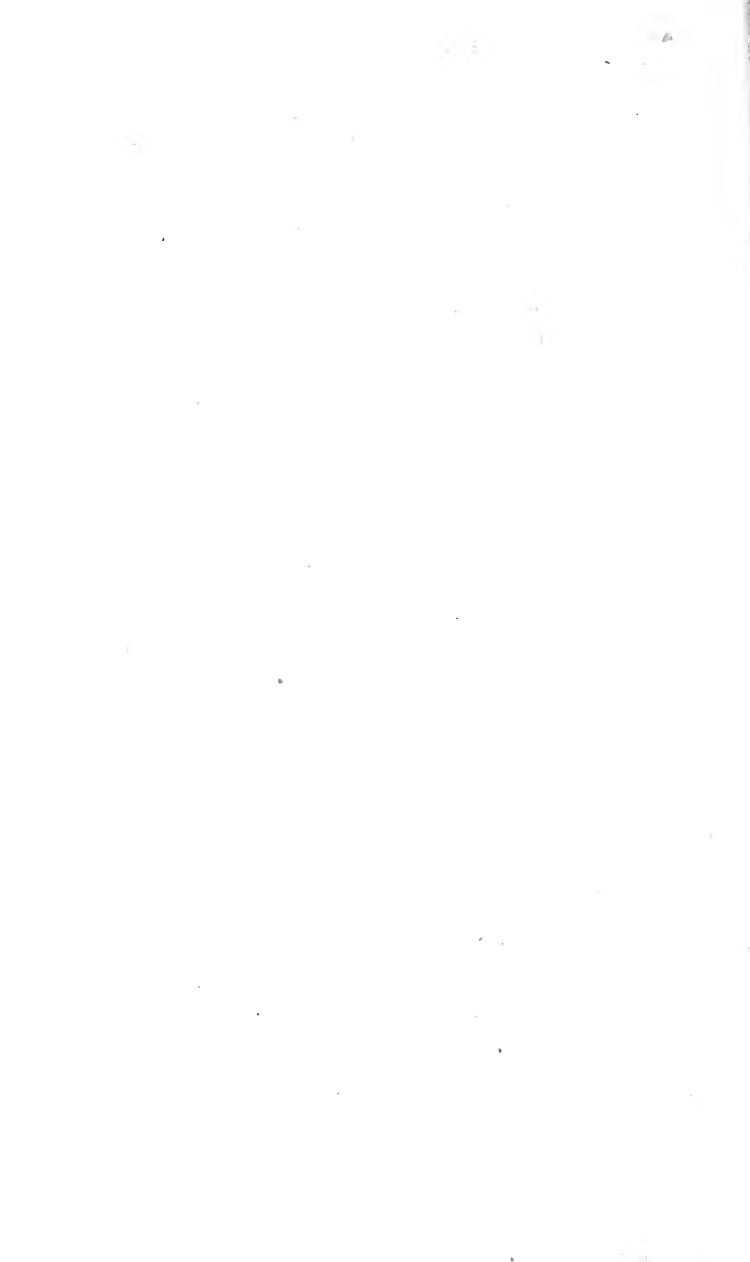
"Long Distance Radio Communication"—*Journal of the Franklin Institute*, April, 1922.

"Recent Types of Hydraulic Transmission Gear"—*Industrial Management*, 6 April, 1922.

"Taking the Riddle out of Radio"—*Scientific American*, May, 1922.

"Cutting and Fitting Beneath the Waves"—*Scientific American*, May, 1922.

"The Industrial Production of Helium.—*Scientific American*, May, 1922.



# NOTES ON INTERNATIONAL AFFAIRS

FROM APRIL 5 TO MAY 5

PREPARED BY

ALLAN WESTCOTT, Professor, U. S. Naval Academy

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## WORK OF GENOA CONFERENCE

CONFERENCE ORGANIZED.—The Genoa Economic Conference opened on April 10, with Premier Facta of Italy as presiding officer. Each of the Allied powers was allowed five official delegates, and the same number was allowed to Germany and Russia, other nations of Europe being allotted two each. All the nations of Europe were represented, and also Japan. At the opening session, upon a reference by the Russian delegate, M. Tchitcherin, to Russia's willingness to consider reduction of armaments, the French delegate, M. Barthou, made a strong protest against the inclusion of this or any other subject not permitted by the Cannes resolutions under which the conference was created. The difficulty was smoothed over by the efforts of Mr. Lloyd George, which drew from M. Tchitcherin a promise to keep to the official agenda.

Against French opposition, both Germany and Russia were given representation on the principal committee, which had to do with the practical application of the Cannes resolutions providing for non-interference in internal affairs, assurance of property rights in nations aided, and recognition of debts. On this main committee, in addition to the delegates of the chief powers, representation was also accorded to four of the smaller powers—Poland, Roumania, Sweden, and Switzerland. Four other commissions were similarly organized to deal with Russia, Finances, Economics, and Transport; and these at once took up the recommendations submitted by experts.

NEGOTIATIONS WITH RUSSIA.—Throughout the earlier stages of the conference the Russian problem was uppermost. In the beginning, after securing admission of the principle of reciprocity in claims for damages, and after admitting Allied claims amounting to sixty-five billion gold francs, Russia put in a fantastic counterclaim of one hundred and twenty-five billion gold francs against the Allies. This she offered to settle on payment by the Allies of two billion francs, with promise of a loan. Russia further offered to cut her army of 1,450,000 (in reality about 600,000) in half if other nations would do the same. After rejecting these proposals,

the delegates of the convening powers set down as conditions to further negotiations that Russia must:

First—Recognize the pre-war debt of Russia.

Second—Recognize the responsibility of the Russian government for the sums borrowed by Russia from the Allies during the war.

Third—Recognize the liability of the Soviet government for property owned by foreigners which the Soviet had nationalized.

That done, Mr. Lloyd George told M. Tchitcherin the Allied powers would consent to receive and consider the Russians' claims against the Allies for the support given to the efforts of Deniken, Kolchak and Wrangel.

**RUSSO-GERMAN COMPACT.**—On April 16, evidently worried by informal discussions going on between Russia and the Allied powers, Germany signed a sweeping agreement with Russia. By the terms of this agreement, (1) the two nations mutually agreed to cancel claims for war damages of all kinds, including civil claims based on the effects of war measures, and also expenses of prisoners of war, (2) Germany renounced both public and private claims for damages as a result of post-bellum measures taken by the Soviet government, with the important provision that the Soviet government should not satisfy similar claims made by any other state; (3) resumption of diplomatic relations was agreed upon; (4) both governments agreed to regulate their commercial relations on "the most favored nation" principle; (5) both governments agreed to mutual assistance in economic difficulties, and to hold a preliminary exchange of views before entering into an international general settlement.

Following out this agreement, it was announced on April 27 that diplomatic relations between Germany and Russia had been resumed, Professor A. Bernhard Wiedenfeld representing Germany at Petrograd and Leonid Krassin going to Berlin.

**CONFERENCE CONDEMNS GERMAN ACTION.**—Upon news of the Russo-German treaty, representatives of the Big and Little Entente and Portugal signed on April 23 the following letter to the German delegates condemning the separate action of Russia and Germany as "contrary to the spirit of loyal co-operation essential to the restoration of Europe," and excluding Germany from further participation in discussion of matters relating to Russia.

"The undersigned desire to acknowledge the receipt of your reply to their note of April 18, indicating the attitude that they felt bound to adopt in view of the treaty concluded by the German and Russian delegations.

"They note with satisfaction that the German delegation realizes the conclusion of a separate treaty with Russia on matters falling within the purview of this conference renders it undesirable that that delegation should participate in the future in the discussion of the conditions of an agreement between Russia and the various countries represented in the conference.

"The undersigned would have preferred to refrain from further correspondence on the subject. There are, however, certain statements in your letter which they feel it their duty to correct.

"Your letter suggests that the German delegation has been forced to conclude a separate agreement with Russia by the refusal of the members of the delegation of the inviting powers to consider grievous difficulties which the proposals formulated by their experts in London would have created for Germany.

"The undersigned representatives of the inviting powers have made inquiries of the members of their respective delegations and find no shadow of justification for this statement. On various occasions members of the German delegation have met and talked with members of the delegations of the inviting powers; but never has it been suggested that the London proposals afforded no basis for discussion in the conference, and that the German delegation was about to conclude a separate treaty with Russia.

"The allegation that the informal discussions with the Russians on the subject of recognition of debts exposed the delegation to the risk of being confronted with a scheme unacceptable to Germany but already approved by a majority of the members of the commission, is equally unfounded. No scheme would, or could, have been accepted by the conference without the fullest opportunity for discussion in competent committees and sub-committees; and in these Germany was represented on a footing of equality with the other powers.

"A misconception of the scope of the experts' proposals or a misunderstanding of the informal conversations with the Russians might well have justified a request for full discussion in the committees of the conference. They can provide no justification for the action which now has been taken, and the undersigned can only regret that your note should have attempted in this way to impose on the other powers the responsibility for a proceeding so contrary to the spirit of loyal co-operation which is essential to the restoration of Europe.

"The undersigned expressly reserve for their governments the right to declare null and void any clauses in the Russo-German treaty which may be recognized as contrary to existing treaties. The incident may now be regarded as closed.

"Please accept, Mr. President, the assurance of our high consideration."

*The note is signed by the representatives of the Big and Little Entente and Portugal.*

**RUSSIA INSISTS ON LOAN AND RECOGNITION.**—On April 21 the Russian delegates made a formal reply to the proposals of the creditor Allied governments. Briefly, the Allied terms were: (1) refusal to admit Soviet claims; (2) a promise to scale down the Russian war debt; (3) insistence upon recognition by the Russian government (a) of debts due foreign nationals, and (b) of the right of such nationals to secure their property rights in Russia or get damages for the loss thereof. The Russian reply accepted these terms with the exception of the matter of property rights, in which matter Russia wished to reserve the right of holding the property and paying therefor. Russia also insisted on a foreign loan and official recognition.

**PROPERTY TERMS CAUSE DIFFICULTY.**—As later presented to Russia on May 3, the Allied terms made no mention of a loan and did not release Russia from her war debt. The property clause in these proposals caused great difficulty among the Allied powers, both France and Belgium refusing to sign the draft as finally presented.

*Genoa, May 3 (Associated Press).*—The complete text of the private property clause which has caused so much controversy is available now. It emphasizes that Soviet Russia has a perfect right to organize such property administration as she wishes, but must return or restore the private property of foreigners, or, failing that, compensate all foreign interests for loss or damage caused them by the confiscation or sequestration of the property.

If it is impossible to reach an accord on the amount of compensation, the former owner can submit the matter to a mixed arbitration tribunal. If the tribunal decides that the compensation offered by the Soviet is just, the former owner must accept it, but if the tribunal rules otherwise, then the former owner can receive from the Soviet government "the right to enjoy his property under conditions at least as favorable for him in everything concerning its use and its free disposition as existed when in previous possession."

If it is found impossible to return the property, indemnity will be fixed by the arbitration tribunal and will be payable in bonds.

The Belgian idea is that insufficient stress is laid on restitution and overmuch on compensation. The Belgians think also that the article as framed gives a leasehold, not freehold, to the former owner when the property is actually returned.

**LLOYD GEORGE PRESENTS WAR DANGERS.**—In a notable speech to British and American press representatives at Genoa on April 26 Premier Lloyd George presented the dangers threatening Europe in the event of failure of the conference.

"The world must recognize the fact," he said, "that Russia and Germany combined contain over two-thirds of the people of Europe. Their voice will be heard, and the Russo-German treaty is the first warning of it."

As proof of the danger he cited the fact that there was no frontier line from the Baltic to the Black Sea, including the Roumanian, Galician, Polish, and Lithuanian frontiers, which had been accepted.

Mr. Lloyd George gave it as his opinion that the disorganization of Europe would affect the entire world, including the United States. He was amazed at people who ignored the portentous fact facing Europe today. Unless Europe reorganized, in other words, unless the Genoa conference succeeded in arranging a compact of peace, he was confident that in his own life, certainly in the life of the younger men present, Europe would again welter in blood.

"We triumphed in the war," he said, "but our triumph will not last forever. If our victory develops into oppression, vengeance will follow, just as Germany's action which started the world war was followed by vengeance."

"We must be just and equitable and show strength. We must realize that Europe is not on good terms and that storms are arising which we must deal with. We had hoped that the end of the great war meant the end of brute force, but unless Europe's problems are solved there is no assurance that force has given way to right."

**FINANCE AND ECONOMIC REPORTS.**—At the second plenary session of the conference on May 3 reports of the Economic, Finance, and Transport Committees were presented and at once adopted. The contents of the finance report was summarized as follows:



The report contained nineteen articles, the main recommendations of which are: the return of stability of currency, the freedom of banks from political pressure, a meeting in the near future of big central banks, the re-establishment of the gold basis, the balancing of budgets, the fixation of a gold value of monetary units by an international convention co-ordinating the demand for gold and an effort to obtain the co-operation of the United States.

Resolution No. 11 lays down the draft of the convention suggested for the Central Banks' meeting, emphasizing the necessity for freedom of exchange. Article thirteen nominates the Bank of England to call a meeting of the Central Banks to consider an international monetary convention. The problem of checking the flight of capital to avoid taxation is left to the League of Nations. The artificial control of exchange markets is condemned. Government loans are advised only in exceptional cases, and advice is given to depend on private capital for government financing.

PLAN FOR NON-AGGRESSION PACT.—From British sources it was learned that Premier Lloyd George's chief hope for the Genoa conference was an agreement of the thirty-two European nations represented to sign a "ten-year truce," after the character of the Four-Power Pacific Treaty, promising to refrain from aggression and to consult in case of difficulties. France on May 4 signified her willingness to sign such an agreement under three conditions: (1) that every other European nation sign; (2) that Russia agree to recognize her existing frontier for ten years; (3) that France surrender none of her rights to take action to enforce the Treaty of Versailles.

Germany objected to this last condition, but declared she would accept a provision to the effect that the Allies *acting together* retain the right to enforce the Versailles Treaty.

## IRELAND

FACTIONS ATTEMPT RECONCILIATION.—During the last two weeks of April, upon the initiative of Mayor O'Neill and Archbishop Byrne of Dublin, several meetings of pro- and anti-free state leaders were held in an effort to reach a compromise agreement on the programme for approaching elections. The plans proposed proved unacceptable to Mr. de Valera.

On May 4, however, a three-days' truce was arranged between leaders of the two factions in the Irish army, during which a committee of five from each side was to consider plans for peace. According to a plan proposed, the cabinet was to be reorganized on a coalition basis; elections to the new parliament would be held in June without contest; and the vote on the treaty would be postponed until later.

## GERMAN REPARATIONS

REPARATIONS ORDER REJECTED.—The conclusions of the Reparations Commission as reached in the middle of March gave Germany until May 31 to accept the Allied proposals. Germany's reply received on April 10

definitely rejected the proposed Allied supervision of German finances, and also declared impossible the new taxes to yield sixty billion marks.

Speaking at Bar-le-Duc, France, on April 26, Premier Poincaré referred to the right of France to take independent action if necessary in the event of German failure on May 31. To consider the threatened crisis, Premier Lloyd George proposed a meeting of the Supreme Council at Genoa, but this location was unacceptable to the French premier.

AMERICAN ARMY CLAIMS RECOGNIZED.—On April 11 Secretary Hughes received a note from Lord Curzon signifying that Great Britain had no desire to question American claims for the expenses of its occupation forces, and promising that the Allied governments would consult as to a proper method of payment. Belgium, France, and Italy also gave similar assurances. It was reported that a small part of the American forces would be kept on the Rhine after July 1.

### NEAR EAST SETTLEMENT

On April 15 the Allied governments proposed to the Angora Turks that the Allied terms of March 16 for a Near Eastern settlement be given a general acceptance, with subsequent negotiations as to the interpretation of particular details. The Angora government, on the other hand, favored immediate discussions, and proposed Ismid as a meeting place. France and Italy were reported to approve this plan, whereas England advocated instead a warning to the Turks to cease hostilities, as a preliminary to any negotiations or the evacuation of Asia Minor by the Greeks.

Italy's withdrawal of forces from the Meander Valley in Asia Minor compelled the Greek army to extend its lines into this region, which was accomplished without difficulty.

At the beginning of May Italy announced an agreement with Turkey which appeared at first to be a compact similar to that negotiated previously for France. The agreement, however, was at least nominally with the Constantinople government, and proved not objectionable to Great Britain. It provided for concessions to Italian firms in Asia Minor.

### UNITED STATES

REVISION OF RULES OF WARFARE.—*Washington, April 28.*—President Harding and Secretary Hughes will reach a decision in the next few days regarding the appointment of a representative or representatives on the international commission to revise the rules of warfare, which, under the agreement reached at the Washington conference, will consist of not more than two members representing the United States, the British Empire, France, Italy, and Japan.

The questions to be considered by the commission are whether existing rules of international law adequately cover new methods of attack or defense since the Hague conference of 1907, and, if they do not, what changes ought to be adopted.

The proposed commission, under the resolution, is at liberty to request assistance and advice from experts in international law and in land, naval,

and aerial warfare. On the conclusion of its investigating the members of the commission are to report their findings to their respective governments, and those powers are thereupon to confer as to the acceptance of the report and the course to be followed to secure the consideration of its recommendations by the other civilized powers.—*New York Times*, 29 April, 1922.

AMERICAN SOCIETY OF INTERNATIONAL LAW.—*Washington, April 28.*—The effects of the Disarmament Conference on China and Japan, on the status of America in the Far East, and on the development of international law, were brought to the fore at the sixteenth annual meeting of the American Society of International Law, which opened here last night. "No formal treaty ever accomplished so much by doing so little," said Elihu Root, president of the society in an address on International Law and the Arms Conference." Mr. Root, outlining briefly the main achievements of the conference, stressed the value of the four-power naval treaty in doing away with mutual distrust, bringing about the end of the Anglo-Japanese Alliance as a possible war cloud upon the international horizon and encouraging the nations concerned to think in terms of peace.

Referring to China, Mr. Root said he was a believer in the "uniting of all sections and parties of the Chinese people for the establishment of an effective government which would be the means of bringing China into full possession of the rights and liberties assured by international law to the members of the family of nations, just as Japan has been brought into that family.

Rear Admiral Harry S. Knapp, speaking of the naval treaty, declared that America had been placed in a disadvantageous position by the inclusion of Article XIX, dealing with naval bases and fortifications. By the provisions of this section, the United States fortifications in the Pacific are kept in *status quo*, and are not modernized as are those of other powers.

"There is no trace of equity for the United States in Article 19," he asserted. "We are the losers in respect to position and resources. The naval treaty marks the decreased influence of the United States in the Far East, and greatly impairs her international prestige."—*Christian Science Monitor*, 29 April, 1922.

CHILI AND PERU NEGOTIATE.—A conference between Chili and Peru to settle the long standing dispute over the frontier provinces of Tacna and Arica was scheduled to begin in Washington about May 12. It was hoped that the delegates might reach a settlement by direct negotiations, the United States not taking part unless by specific request.

WRANGELL ISLAND CLAIMED FOR CANADA.—*New York, April 28.*—The desire to guard Wrangell Island from possible seizure by Japan was one of his reasons for claiming it in the name of the Dominion of Canada, Vilhjalmur Stefansson said today when asked about a report from Washington that the state department was looking into the title to the island, upon the assumption it already was a part of the territory of the United States.

"I can't see how any American claim to the territory can be substantiated," replied the explorer. "A British naval expedition under Captain Kellett declared the island a British possession in 1849. There was no question then about the British character of the island.

"There is a peculiarity about island sovereignties, however. After a period of five years, an island claimed in behalf of any nation becomes a No Man's Land unless properly inhabited and administered in behalf of that nation."—*Christian Science Monitor*, 29 April, 1922.

U. S. RUSSIAN POLICY UNCHANGED.—Speaking on May 1 to a delegation favoring the recognition of the Soviet Republic, Secretary Hughes strongly defended the American government's past policy. Secretary Hughes said in part:

"Our interest in the people of Russia has been manifested in the most unmistakable manner, and I do not think that it requires any statement at this time to indicate how anxious we are for the full restoration of the economic power of the Russian people and for their well-being in every way.

"There is no disposition to interfere with the Russian people in working out their own destiny. There is no desire to interfere in their internal affairs. The principle that is involved is one that we cherish here. Its application has been somewhat complicated by the organized efforts on the part of the Soviet régime to interfere in the domestic affairs of other peoples.

"With respect to intercourse, it is quite evident that you are under a serious misapprehension. There are no legal obstacles to trade with Russia. The obstacles that exist to trade with Russia are due to the situation in Russia, which is in the control of those who dominate the affairs of Russia. Some time ago I pointed out the essential conditions for a return to productivity in Russia. That was not a formula; that was not an artificial conception; that was simply a statement of fact. Russia needs credit, but it is idle to expect credit unless there is a basis for credit. That basis for credit cannot be supplied from the outside. That basis for credit has got to be supplied inside of Russia.

"Political recognition follows the establishment of a sound basis for intercourse. Political recognition is dependent upon the existence of a government that is competent to discharge its international obligations. This whole matter is in the control of those who dominate the affairs of Russia. We are most desirous to do what we can to aid in Russia's recuperation, but they must establish the basis for such recuperation."

## FAR EAST

CIVIL WAR IN CHINA.—Toward the close of April, hostilities opened between the forces of General Chang Tso-lin, governor of Manchuria and chief military leader of northern China, and an army under General Wu Pei-fu, commander of the central Chinese forces. The fighting took place chiefly in the immediate vicinity of Peking and along the Peking-Tientsin railway.

Both generals were in the military combination that upset the pro-Japanese Anfu government at Peking two years ago. Apparently General Wu's fears were aroused by the presence of General Chang's forces near Peking and by his reported alliance with the Canton government under Sun Yat-Sen. Accordingly he struck to capture Peking and to drive General Chang's troops northward. General Wu had strong popular support, while Chang was suspected of being under Japanese influence. The Peking government itself could do nothing more than proclaim neutrality. On May 5 General Wu's forces were victorious and entered Peking.

## REVIEW OF BOOKS

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THE MARINES HAVE ADVANCED, by Lieutenant-Colonel Charles Bishop, Jr. Published in 1921 by the Penn Publishing Company. Price, \$1.75.

This is a story for young men and for boys above sixteen years of age. It is a sequel to *The Marines Have Landed*, written by the same author and it relates the further adventures of Dick Comstock, the hero of both books. The story is full of historically accurate incidents of the years 1913 to 1917, and reflects the feelings of the enlisted men under various pleasant and unpleasant conditions that seem very true to actual life.

The stirring action makes the book excitingly interesting, and its moral and patriotic tone leaves a wholesome and stimulating effect on the reader.

The characters, Dick Comstock, the hero, and Sergeant Dorlan, the typical Irishman, are well drawn and attract the undivided sympathy of the reader from beginning to end. One very impressive and valuable chapter is that wherein the weakling, Horace Maxim, suddenly discovers that by accepting money in exchange for copies of some seemingly trifling papers he has placed himself at the mercy of his bribers, who now demand of him the performance of obviously dishonest and dangerous deeds. The agonies he undergoes for a short time vividly reveal the fearful consequences that will surely follow the first false step of an embryonic traitor. One apparent defect in the tale is that the readers reasonable expectation to see justice meted out to this despicable character is doomed to disappointment; it would seem that an offense so serious as that committed by Horace Maxim should be properly punished when detected, and yet we are told that he got his discharge and no punishment. Some parts of the book are purely historical and of sustained interest only to those who are students of history. Yet, on the whole, the book is good and deserves a large circulation. We predict that it will become popular, especially among prospective sailors and soldiers.

A. M. W.

THE BLOCKING OF ZEEBRUGGE, by Captain A. F. B. Carpenter, V. C., R. N. Houghton Mifflin Company, 1922, Boston and New York. Price \$3.50.

A large number of our officers remember Captain Carpenter most pleasantly, having attended the lectures he gave in this country in 1919, and are fairly familiar with the operations described, and consequently

pleased that he has written in permanent form of the conduct of those operations of St. George's day, 1918, which gave all of the Allies great encouragement by the dash and keenness exhibited by the forces of the Dover Patrol.

The book is dedicated to the man-in-the-street and hence the naval reader must not expect to find details of the operations explained in a manner to satisfy the desires of a technical mind. Yet they are set forth interestingly and in pleasing sequence. The number of naval craft of all kinds required to carry out the operation will astonish most certainly the layman and make the naval officer take a long breath. In order to sink three blockships at Zeebrugge in the mouth of the canal from Bruges required the co-operation of one hundred and sixty-two vessels in addition to supporting squadrons at sea, such as seven light cruisers, two leaders, and fourteen destroyers.

The origin of the plan is given as in the Admiralty about November 13, 1917. Its expected results were: (a) by a reduction in enemy activity, because of longer passage necessitated by use of more distant bases such as Heligoland, there would be a decrease in number of Allied vessels sunk by mine or submarines as well as a decrease in raid activity by German torpedo craft; (b) the movements of high sea fleet would be hindered by the loss of such a convenient advanced base for its attendant small craft; (c) an actual reduction in number of submarines and torpedo boats, for, on an average day, many submarines and torpedo craft were repairing and resting at Bruges, would take place because of the exits of the canal being closed. The loss of prestige in the German navy must eventually become of great importance because such a bold operation would be contrasted with the navy's long inactivity.

Stonewall Jackson's phrase that one must mystify, mislead, and surprise an enemy, if he is to succeed in any such enterprise, was taken as the guiding principle in the plan which is carefully unfolded in Part I of the book and adhered to in the actual operation related vividly and interestingly in Part II.

That two starts of the expedition were made and the objective of the preparations carried out, as they were in many places and on many vessels, did not become known to the enemy speaks volumes for the efficient secrecy with which the expedition was guarded. The third start was carried through and resulted in the actual blocking of the canal and yet found the Germans absolutely unprepared to prevent this operation.

The type of manhood displayed in this operation, where gallantry and supreme disregard of self are so conspicuous, makes the navy personnel fore and aft feel the prouder of their profession and cherish the new tradition thus made.

The illustrations are very important and excellent, sufficient maps and diagrams being included to permit of a clear grasp of the situation being made by the reader.

The introduction by Admiral Earl Beatty, the appreciations by Marshal Foch, Rear Admiral Sims, and Count Visart, the Burgomaster of Bruges, express in different ways their unqualified admiration for the men and officers of the British navy engaged in this blocking of Zeebrugge, and add to the value of the book.

R. E.

JANE'S FIGHTING SHIPS, 1921; Joint Editors: Oscar Parkes, M.B., and Maurice Prendergast. (Published by Sampson Low, Marston & Co., Limited, London.)

This, the twenty-fourth issue of *Jane's Fighting Ships* (founded in 1896), comprises 633 pages of text and illustrations with 82 additional pages of classified advertisements.

The feature of this 1921 volume is the addition of a series of "Special Memoirs," dealing with the principal foreign naval powers. Each of these Memoirs is divided into three main parts: (a) administration, (b) organization of the fleet, (c) personnel. The administrative sections are subdivided into two parts, denominated "Central" and "Local." The "Central" subsections describe the composition and functions of the various navy departments or ministries of marine; also the naval staffs and advisory councils. The "Local" subsections concern the organization and control of the "Naval Districts." Naval policy and programs are also dealt with, usually under the heading of "administration." It is regrettable that no special memoir has been given for the British navy, as "time and space were not available for so enormous a task." The editors, however, have stated that this is an improvement reserved for future years. These "Memoirs" take the place of the "Special Article" introduced in last year's edition, and are drafted to a uniform system which makes them particularly useful for purposes of reference and comparison.

The larger illustration for modern battleship and battle-cruiser types used in the British navy section of the 1920 issue have been extended in this 1921 edition to the United States navy.

The minor European navies are considered in the following groups: "New Baltic Group" (Finnish and Polish navies); "North Sea Group" (German and Netherlands navies); "Scandinavian Group" (Swedish, Norwegian, and Danish navies); "Peninsula Group" (Spanish and Portuguese navies); "Balkan Group" (Grecian, Roumanian, Austrian, and Hungarian navies). It is interesting to note that the German navy has undergone a complete reorganization which is described in a "Special Memoir."

Another innovation is an "obituary list" of deleted ships accompanied by notes explaining their disappearances.

The editors are indeed to be congratulated on their skill and industry in gathering together data covering more than six thousand warships with plans, silhouettes, sketches, and photographs which go to make up this indispensable encyclopedia of the navies of the world.

C. C. G.





KEEP THE INSTITUTE INFORMED OF YOUR  
ADDRESS

It is earnestly requested that members send in their correct addresses whenever they make a change; for unless they do, we shall be unable to guarantee prompt delivery of their PROCEEDINGS, as issued.

SECRETARY AND TREASURER.

## NOTICE TO MEMBERS

More members, both regular and associate, are desired. Any increase in membership invariably means a larger number of articles submitted, and consequently an improvement in the PROCEEDINGS.

You are requested to send or give the attached slip to someone eligible for membership, urging him to join.  
By direction of the Board of Control.

Attention is invited to extracts from the constitution on the opposite page as to the requirements in making applications for life, regular and associate membership.

*To the Secretary and Treasurer,  
U. S. Naval Institute,  
Annapolis, Md.*

*Dear Sir:*

*Please enroll my name as a { regular } member of the U. S. Naval Institute from { associate }*

*Very truly yours,*

Members are liable for the payment of the annual dues until the date of the receipt of their resignation in writing. Annual dues \$3.00.

.....1922.

## NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-ninth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

### ARTICLE VII

Sec. 1. The Institute shall consist of regular life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nomination shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

### ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, \$3.50; enlisted men, U. S. Navy, \$3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

## SPECIAL NOTICE

### NAVAL INSTITUTE PRIZE, 1923

A prize of two hundred dollars, with a gold medal and a life membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the following pages are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1922 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1922. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1922 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and a number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

F. M. ROBINSON,

*Lieut. Commander, U. S. Navy, Secretary and Treasurer.*

## TOPICS FOR ARTICLES

### SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

Aviation—Its Present Status and Probable Influence on Strategy and Tactics.

The Anti-Aircraft Problem from the Navy's Viewpoint.

Co-ordination of the Naval Air Force with Other Naval Forces.

Naval Bases, Their Number, Location, and Equipment.

Military Character.

The Relation of Naval Communication to Naval Strategy.

Proportion of National Budget Which Should be Devoted to Naval Expenditures.

The Necessity for Having a Fleet.

Organization of Fleet for War.

The Offensive and Defensive in Gas Warfare.

The Best Protection from Gas Attack.

Naval Gunnery of Today, the Problems of Long Range and Indirect Fire.

Physical Factors in Efficiency.

The Relation between the Navy and the Merchant Marine.

America as a Maritime Nation.

Relation of the Medical Department to a Plans Division.

The Place of Mines in Future Naval Warfare.

A Mobilization Program for the Future.

Morale Building.

The Mission of the Naval Academy in the Molding of Character.

How to Best Educate and Convert the American People to the Need of a Strong National Defense.

The Navy in Battle; Operations of Air, Surface, and Underwater Craft.

Navy Spirit—Its Value to the Service and to the Country.

Based on a Major Ship Strength of 'Eighteen Dreadnoughts, What Do You Consider a Balanced Navy?

The Future of the Naval Officers' Profession.

The Naval Officer as a Diplomat.

Is the Present System of Training and Education for Officers Satisfactory and Sufficient?

The Role of the Navy at Peace.

Training Naval Personnel During the Next Ten Years.

Six Years of Promotion by Selection in U. S. Navy. Its Effect Upon Discipline and Morale.

The Employment of Retired Officers Separated from the Service by Reason of the Age in Grade Feature of the Existing Selection Law.

What Measures Should be Adopted to Create and Maintain a Balanced Enlisted Personnel of 120,000 Men?

Our Future Naval Policy Based on Existing International Treaties.

The Future Naval Continental Shore Establishments.

Shore Duty for Enlisted Men.

The Limits of Specialization in Naval Training.

The Effect of the 5-5-3 Ratio Upon U. S. Naval Strategy in the Eastern Pacific.

Armor or High Speed for Large Surface Vessels?

Airplanes and Submarines Versus Super-Dreadnoughts.

The Navy's Relation to the Nation in World Affairs.









